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ON THE MICROSCOPIC AND GENERAL CHARACTERS OF THE PEACH TREE AFFECTED WITH THE "YELLOWS."

BY W. K. HIGLEY.

SYMPTOMS OF THE YELLOWS.

1. *Premature Ripening.*—This symptom is one of the most common, although it is not by any means always noticed. In many cases it is very marked. During my investigation I have corresponded freely with persons upon this subject, and many have stated that this is only a marked symptom in certain varieties, prominent among which is "Stanlie's late." Mr. John Williams, of South Haven, sent me specimens of this variety that ripened three weeks before the proper time. This symptom is not wholly confined to the peach affected with the yellows, as it is also said to be produced by the borer and curculio, but from all the evidence that I have been able to glean, I think that it can be safely stated that it is an infallible symptom when noticed in some localities. I cannot agree with those who state that this symptom is only noticed in certain varieties, but think that although it may not always happen, yet when it does it is just as liable to be on one variety as another. It is, at all events, a thing to be looked after when the presence of this disease is feared.

2. *Color of the Peach.*—I have noticed particularly that affected peaches, when opened, presented a very abnormal appearance as to the position, extent and size of the pigment spots. In the normal fruit bright red spots are often present near the pit and, perhaps, even toward the outer portions of the cellular part,

while in the diseased fruit, especially that which has prematurely ripened, near the pit considerable red coloring matter may be noticed, often in a conglomerate mass, and scattered through the remainder of the fleshy portions many oblong or rounded masses of the same color. Under the microscope these appear to be simply cells filled with a coloring matter that may be removed by treating with strong potassic hydrate, acetic acid, or alcohol. The skin of the peach also shows a highly abnormal color, generally simply spotted with red, but in some specimens that I have had the opportunity of examining, this red color assumed an oblong shape, the spots being arranged in bands. This symptom seems to be of the highest importance, as there is no other disease, so far as I am able to ascertain, that will produce the above results.

3. *Production of Abnormal Branches.*—Perhaps one of the most marked symptoms of the yellows is the abnormal production of branches, or rather branchlets. But the pomologist must guard against one important fact in diagnosing the yellows from this symptom, viz., *the production of numerous twigs.* Non-cultivation of any domesticated tree will often cause a great abundance of small twigs or shoots to grow from the secondary branches; they may continue as high as the sixth division into branches. Again a great proficiency of twigs may be produced by the use of much rich manure year after year. However, to return to the discussion of branchlets as an indication of the yellows, let it be remembered that it is the branchlets and not the twigs that are of importance. These are produced on the main or larger branches from lateral buds, and in some cases even from the trunk of the tree. They are slender wire-like shoots, often no larger than a needle, from two to eight inches long, and not seldom showing a tendency to throw out lateral or secondary shoots. They may attain to a much greater length, but, as far as I can ascertain, the above measurements form a good average. This peculiar feature of the disease is easily explained. A spore of the fungus falling upon some part of the branch, finds the conditions favorable for development and sends out its mycelium which ramifies through the tissues of the limb and soon fills up the passages, crowding the vessels and cells so that the flow of sap to the parts beyond this point is nearly stopped; thus the ends of the growing branches being choked, the sap is caused to flow to the lateral buds, and these having so plentiful a supply of nutriment, grow

rapidly and throw out these wire-like shoots. This symptom, with the one previous, are sure and infallible guides to the detection of the yellows; they often occur together, but more often the former is the second stage, only appearing after the latter has been present the year previous. I examined carefully several specimens of these branchlets, and in two-thirds of them I found the mycelium of a fungus in the tissue. Those in which the fungus was present were from South Haven, the remainder from other localities showed no signs of mycelial growth. It is very probable, however, had time permitted extended sectional examinations, that I should have found, even in these, evidences of parasitical forms.

4. *Microscopical Symptoms.*—There are many marked peculiarities noticed when sections of the different parts of a tree are studied, but whether or not some of these will be produced by other causes than the yellows, is a subject too patent to need any discussion. One of the most important points noticed in microscopical examination, is the *loose character of the cells* and other parts of the section, both transverse and longitudinal. This would only be noticed by one who has carefully compared both sections of the healthy and unhealthy tree. I was very much surprised when I first noticed this condition of things, and hoping that it might give me some clue to the cause of the disease, I examined several more specimens, but with no important results, except that it was a constant character of the diseased specimens that I had; it appeared in sections of the root as well as in those of the aërial portions. Attention may be called also to the sheets of mycelia that are sometimes found between the layers of wood as probably another symptom. Some of the many investigators who attribute the yellows to a fungoid growth, consider this as very marked evidence of the yellows, but it is not near so marked as is the abnormal coloring matter noticed in the pith. In the specimens of the wood of diseased trees that I have been permitted to examine, the most prominent microscopical symptom was the decided separation of the annual growths of wood; in the space thus formed no structure was visible, although apparently filled with some material, perhaps the ends of mycelia. I found it quite difficult to make sections of the diseased limbs and other parts of the aërial portions of diseased trees, for, on account of this loose structure, the cells, especially of the bark, were

easily displaced, thus showing that one effect of the disease is a tendency toward *disorganization*. How far this character may extend, I am unable to say, but it was very marked in all the specimens sent me. I was unable to make thin sections for study until the parts were soaked in strong alcohol or chromate solution for some time. I am informed that a gentleman, whose name I am not able to obtain, claims that in nearly all the sections of diseased specimens that he examined, he noticed that a great number of the cells of the pith and inner bark and many of those of the woody portions were ruptured and completely disorganized. Although I have examined a number of sections, looking carefully in each for ruptured cells, I have not been able to find any. Therefore I can only give the above statement on authority not being able to sanction it by my own work. I have no doubt that some one or more very important microscopical symptoms may be found, on the comparison of more specimens from many localities, that are not enumerated above.

5. *Appearance of the unmagnified Section.*—A section of the trunk of a tree, well along in years, shows peculiarities to a marked degree. One first notices the yellowish color which pervades the whole section, with the rings marking the annual growths of a darker color, perhaps a light brown, and then the dark spots scattered through the woody portion. It very forcibly reminds one of a bilious state of the system. A section of the root presented nothing abnormal to the naked eye.

6. *Appearance of the Leaves.*—The leaves upon the diseased branches have a general sickly appearance, are of a pale color and more or less dried. Especially are the leaves of the abnormal shoots or branchlets characteristic; these are pale and often more or less curled. There seems to be a greater number of leaves than is normal, upon diseased trees, especially before it has lost the greater part of its vitality. This is not to be wondered at, as the leaves are really the lungs of the tree, the green matter acting the part of an absorbent. If now several of the branches become diseased and the leaves lose their power to act, it seems natural that in order to obtain that nutriment necessary for vitality, assigned to the leaves, more leaves would be formed upon the healthy portions of the tree. Soon there has been so much of the nutriment of the tree used to overcome this gasping caused by the diseased branches, whose trouble is steadily advancing to

other branches, that but little is left to form the fruit, and thus the peaches grow smaller and fewer in numbers after the first premature ripening until the tree dies!

As so many other causes, as a direct effect, produce a diseased condition of the leaves, they can hardly be accepted as a true symptom of the yellows, unless in connection with other marked indications.

Perhaps I have said more upon the symptoms of the yellows than many would consider necessary, but it is well known that the physician diagnoses a disease from the symptoms, and then looks for that which will produce the cure. In plain words, the indications give him a clue to the cause and what will afterwards be essential for the cure. To this end I desire to call forth from the *practical and scientific fruit growers* a report of what they have noticed, whenever it has been their privilege to observe the symptoms and action of this disease, hoping that I may glean from these reports something that may guide us in our work.

Nearly every species of parasitical fungi has its special host, often carrying this so far as to refuse to grow upon a closely-allied species or variety. Many others will grow upon allied hosts provided the true host is removed. But this does not seem to be the case with the fungus that we are dealing with at present; it is characteristic of the peach alone. Hill's Chili seems to suffer the most, but still it clings to other varieties just as tenaciously when once introduced into an orchard. There is no doubt but that we can safely say "*no variety is exempt.*"

SOIL AND PREVENTIVES.

Does the soil have any effect upon the yellows? In answer to this question, I should say, *directly no; but indirectly it does.*

I am quite positive that if the orchard is kept in the proper state of cultivation it will not be as apt to contract the disease, although I cannot say that this is a preventive in the face of all the evidence to the contrary. It is a well known fact, however, that if the digestive, circulatory and respiratory organs in man are in their proper state, there is not near as much danger of the body contracting a disease. I believe that this is, to a great extent, also characteristic of the vegetable kingdom. Thus the right food and care, or in plain words the right cultivation, fertilization and pruning, may, to a great extent, aid the pomologist in his

warfare against the yellows. On the other hand, lack of care in cultivation, etc., may reduce the tree to such a condition that it becomes susceptible to disease, and is more liable than in the first case to catch this troublesome malady.

Downing says,[1] "Let us look for a moment into the history of the peach culture in the United States. For almost an hundred years after this tree was introduced into this country, it was largely cultivated, especially in Virginia, Maryland and New Jersey, as we have already stated, in perfect freedom from such disease [the yellows], and with the least possible care. The great natural fertility of the soil was unexhausted, and the land occupied by orchards was seldom or never cropped. Most of the soil of the States, however, though at first naturally rich, was light and sandy, and in course of time became comparatively exhausted. The peach tree, always productive to an excess in this climate, in the impoverished soil was no longer able to recruit its energies by annual growth, and gradually became more and more enfeebled and short lived."

I have great regard for the opinion of practical experimenters and investigators—the horticulturists of our country—but looking at the matter from a scientific standpoint, I must confess that I firmly believe that if great care be exercised in cultivation, pruning, etc., the fruit grower will be greatly aided in reducing the spread of this disease.

I can but agree with Professor Kedzie when he says, "I think the trees lack potash and phosphoric acid." These may be applied in cultivation by mixing them, either separately or combined, with the earth around the base of the tree where they can be absorbed by the roots; or superphosphate of lime and ashes may be used.

The subjects of cultivation and the preservation of the trees and the prevention of this disease by this means, belong rather to the practical investigator than to the microscopist or chemist, for we, working with our microscope and test-tube, can only suggest and theorize, while the experiments must be left with those who raise the trees. In concluding these remarks, I am glad to be able to say that many are carefully experimenting and noting their observations and results.

[1] "Fruits and Fruit Trees of America," eighth edition, p. 464.

HISTORY.

A few of the statements made above led me at this point to consider the history of this disease.

It is one of the oldest tree diseases on record in this country. It seems to have first appeared in the Atlantic States, or near that region. It does not seem to have been imported, as there is no record, as far as I can ascertain, of its ever occurring in the old world before its presence was detected here; and, moreover, the only note that I have noticed of its presence in Europe, stated that it was brought from this country in the pits, and the trees raised from them showed symptoms of the yellows and soon died.

"About 1800, or a few years before, attention was attracted in the neighborhood of Philadelphia to the sudden decay and death of orchards without apparent cause. From Philadelphia and Delaware the disease gradually extended to New-Jersey, where, in 1844, it was so prevalent as to destroy a considerable part of all the orchards. About three or four years later it appeared on the banks of the Hudson (or from 1812 to 1815), gradually and slowly extending northward and westward, to the remainder of the State. Its progress to Connecticut was taking place at the same time, a few trees here and there showing the disease until it became well known (though not yet generally prevalent) throughout most of the warmer parts of New England."[1]

Downing continues with many remarks confirming further what has been said under the action of the soil and preventives. For this reason I shall quote still further from his work:[2]

"It should be here remarked that, though the disease had been considerably noticed in Maryland and Middle States previously, yet it was by no means general until about the close of the last war. At this time wheat and other grain crops bore very high prices, and the failing fertility of the peach orchard soils of those States was suddenly still more lowered by a heavy system of cropping between the trees, without returning anything to the soil. Still the peach was planted, produced a few heavy crops, and declined, from sheer feebleness and want of sustenance. As it was the custom with many orchardists to raise their own seedling trees, and as almost all nurserymen gathered the stones *indiscriminately* for stocks, it is evident that the constitutional debility of the parent tree would naturally be inherited to a greater or less degree by the seedlings. Still the system of allowing the tree to exhaust itself by heavy and repeated crops in

[1] "Fruit and Fruit Trees of America," p. 464.
[2] Page 464.

a light soil was adhered to, and generation after generation of seedlings, each more enfeebled than the former, at last produced a completely sickly and feeble stock of peach trees in those districts.

"The great abundance of this fruit caused it to find its way, more or less into all the markets on the sea-coast. The stones of the enfeebled southern trees were thus carried north, and, being esteemed by many better than those of home growth, were everywhere more or less planted. They brought with them the enfeebled and tainted constitution derived from the parent stock. They reproduced almost always the same disease in the new soil and thus, little by little, the yellows spread from its original neighborhood, below Philadelphia, to the whole northern and eastern sections of the Union. At this moment it is slowly but gradually moving west, though the rich and deep soils of the western alluvial bottoms will, perhaps, for a considerable time, even without care, overpower the original taint of the trees and stones received from the east."

As to the appearance of the yellows in New Jersey, I will quote again:[1]

"A gentleman to the peach 'manor born,'—in Monmouth county, N. J.—but who has resided in this vicinity during the past ten years, informs us that he has witnessed the destruction of the peach orchards in these localities during the past thirty years. First in Monmouth county, about 1850, the yellows made its appearance, and culminated in the destruction of the peach orchards about 1856. Monmouth county and vicinity were famous in their day, having often glutted the eastern markets with peaches. Driven from the Atlantic coast counties by the yellows, the prominent peach growers of New Jersey located in Morris and other counties in the north of the State, where peaches were grown successfully until about 1867, when New Jersey peach growers were again driven by the yellows to 'fresh fields,' favorable localities in Delaware and Maryland being chosen, from whence the eastern markets have received their principal supplies during the past few years. Incipient signs of yellows have appeared in Delaware and Maryland, and it is evident that a 'change of base' will soon become necessary."

In the same volume it says: "The first record of the peach yellows is found in the *Genesee Farmer*, and was published about forty-five years ago. The disease as it now exists was accurately described. The Farmers' Book, which was compiled and printed at Chambersburgh, Penn., Sept. 16, 1845, contains a communication from Sidney Weller, Halifax county, North Carolina." So

[1] Michigan Pomological Report, 1878, p. 256.

it seems that previous to 1845 it had been detected in North Carolina.

The disease appeared in Michigan about 1857; the exact time is not known, nor by what method it was introduced. To my knowledge it has not been reported in Ohio or Indiana. If this be true it is a query how it got to Michigan unless imported in the fruit or young trees brought from nurseries in infected districts. This I believe to be the case, and have a faint recollection of seeing a published statement to that effect.

The orchards of the South Haven district seem to have been the first to suffer.

From the above facts of history, it will be seen that this disease is one that progresses slowly, and yet in one sense rapidly, and is as sure in its results as is pulmonary consumption. It is to be hoped that such active measures shall be taken that its future history shall not cover near as much territory as at the present time. It is a disease that, unless checked in its progress, will follow wherever civilization advances.

[*To be continued.*]

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ON THE SO-CALLED CHUKCHI AND NAMOLLO PEOPLE OF EASTERN SIBERIA.[1]

BY W. H. DALL.

THE natives of that portion of Asia lying east of the meridian of 180° from Greenwich, and between Behring sea and strait and the Arctic ocean, have always been regarded with particular interest. This interest arises partly from the fact that they alone of all the Siberian tribes have maintained their independence of Russian authority, and partly from the idea that these people form a link between the races of Asia and America; a thorough knowledge of their ethnological position being supposed to be all that was required to confirm or disprove certain theories of migration.

Another source of interest is the confusion that has always existed in regard to their division into different stocks, and which is still far from being cleared away. The forthcoming work of Lieut. Nordqvist, of the *Vega* Expedition, will doubtless afford

[1] Read before the American Association for the Advancement of Science, Cincinnati, 1881.

means of rightly locating a part of these people and the rest will doubtless be cleared up before many years by new investigations.

F. von Stein, in *Petermann's Mittheilungen*,[1] has recently given an interesting résumé of the information in regard to these people contained in articles by Nordqvist and Hovgaard in the Isvestia[2] of the Russian Geographical Society; among others who have contributed some information on the subject, most of whom are referred to by Stein, are Wrangell,[3] Neumann,[4] Maydell[5] (or Maidel), Kennan,[6] Bush,[7] Stimpson,[8] Professor Asaph Hall[9] and Dall.[10] Others, to whom I have seen no reference made, are Shismareff[11] and an unknown writer in the Journal of the Interior Department[12] of Russia, both articles being in the Russian language.

In a summary of our work for the season of 1880 (being an abstract of a letter from me describing my third visit to the coast of Northeast Siberia), contained in the January number of the Royal Geographical Society's Proceedings, this paragraph occurred:

"It was remarked that the proper name of the people on the Asiatic side described by Nordenskiold and his companions, and previously by Hooper[13] and Mr. Dall, is Yū'-it, a corruption or shortening of In-nū-it (Eskimo), of which they merely form one tribe. They are totally distinct in language, race and manners from the so-called Reindeer Chukchis *(Tsau'-yū-at)*, who are a mere tribe of the Korak nation."

To this somewhat ambiguous and not literally exact statement, Lieut. Nordqvist has taken exception in a communication to the

[1] 1881, Heft II, pp. 41–45.

[2] Band XVI, Heft II, 1880.

[3] Narrative of an expedition to the Polar sea (Sabine's ed.). 8vo. London, 1840 (p. 126). Cf. also The Telescope, 1835, No. 26.

[4] Hist. Ubers. Tschuktschen Exp.; Isv. Sib. Abth. Russ. Geogr. Soc. Vol. I, Nos. 4–5, II, No. 3, 1871.

[5] Antworten der Tschuktschen Exp.; Isv. l. c. II, Nos. 1 and 2, pp. 60–70; 1871.

[6] Tent Life in Siberia, etc. 12mo. New York and London, 1870. (p. 120.)

[7] Reindeer, dogs and snowshoes. 8vo. Harper Bros., 1871. (p. 426.)

[8–9] Cf. Alaska and its Resources, pp. 549–554.

[10] Alaska and its Resources, Boston, 1870, pp. 374–385. Also, Contr. to Am. Ethnology (J. W. Powell), I, pp. 12–15, 93–106, 1877. Also Proc. Roy. Geogr. Soc., Jan., 1881, pp. 47–49; Sept., 1881, pp. 568–570.

[11] Zapiski Hydr. Dept., X, pp. 178–200, 1852.

[12] Zhurnal Minist. Vnutr. Diel, 8vo, St. Peterburg, 1835, XVI, 5, and 1851, Nos. 6–7.

[13] Ten months among the tents of the Tuski, etc., 8vo, London, J. Murray, 1853.

Imperial Geographical Society of St. Petersburg,[1] which I have not seen, but which is summarized in a note in the Royal Geographical Society's Proceedings for June, 1881.[2] According to the editor, Lieut. Nordqvist's observations are as follows:

"According to Lieut. Nordqvist the stationary and nomad Chukchis both belong to the same race, and call themselves in the singular 'Chau-chau,' and in the plural 'Chau-chau-ate.' These people, he says, live to the north of Cape Chukotsky, and must not be confounded with the true Eskimo who live to the south of it, chiefly on the shores of the Gulf of Anadyrsk, as far as Cape Oliutorsky, a fact which Lieut. Nordqvist urges, is incontestably proved by a comparison of the idioms in the languages of the two peoples."

While not holding Lieut. Nordqvist responsible for the literal words of the above note, it was evident that some misapprehensions entered into his suppositions concerning the people on the coast referred to, as well as some errors of my own to be corrected. This called my attention to the subject, and induced me to overhaul my notes and look up the Russian literature of the subject, trusting that to Lieut. Nordqvist's valuable investigations in regard to the people on the north coast of Siberia, west of East cape, some facts might be added in regard to those on the eastern and southern shore of the same great peninsula.

On the Siberian coast south and west from East cape, the *Vega* spent less than a day at St. Lawrence bay, and little more than a day and a half at Konyam bay, a length of time insufficient to give to the members of the party more than a cursory glimpse of the people, without affording any ground for positive statements; as indeed is frankly admitted by these gentlemen (according to Stein's digest of their publications), who express themselves with due reserve in regard to the ethnological problems of this section of the coast.

The summary of the season's work was written by me while on the voyage home, having then seen only Palander's narrative, which appeared in the *Scientific American Supplement*, Nos. 231 and 232. There being little doubt that at some former time the Eskimo had occupied the north coast of Siberia as far west as Koliuchin bay; the description of the manners and customs given by Palander of the dwellers on that coast agreeing precisely with

[1] Published in its Bull. fascic. II of 1881.

[2] l. c. p. 36.

those of the Eskimo tribes further south; and the few words given of their language belonging, at least in part, to the jargon spoken by both Eskimo and Korak (or Chukchi) in communication with the whites and with each other, it was not all unnatural to suppose that the winter neighbors of the *Vega* were Eskimo (or, as formerly distinguished, sedentary Chukchis) similar to those with whom I had had personal intercourse.[1]

The observations of Lieut. Nordqvist must be taken as conclusive in relation to the people with whom he was brought in contact. Hence we must conclude that at the present day the inhabitants of the region on the north coast of Siberia, west from East cape and as far as Cape Shelagskoi, belong to that branch of the Korak nation which form the original genuine Chukchi of the early Russian explorers. They are, however, not the wandering or reindeer Chukchi, but that part of the nation which gain their living by sealing and fishing. The *Vega* party were visited by reindeer Chukchi, during the winter, repeatedly; some from the vicinity of Behring sea appearing on two occasions, but in Stein's paper no reference is made to any comparison between them and the fishing Chukchi, by which the differences in life and manners might be made clear. The names Chukchi, sedentary Chukchi, etc., have been used in such a confused manner that they no longer have any clear signification, and it is desirable that they should be discarded entirely. For instance, in speaking of sedentary Chukchi, I should refer to the Eskimo of N. E. Siberia, to whom that appellation has generally been misapplied, but Lieut. Nordqvist would understand the north coast people of his wintering place, to whom it more properly belongs. It will, therefore, be advantageous to preface any discussion of the different branches by a synonymy which will show what is meant by any particular name. For the real, original wandering Chukchi, who live by their reindeer and by summer fishing, the name of

[1] Of the twenty-three words given in Palander's account (as printed in the cited work) three were Eskimo or corrupted Eskimo; seven were recognized as similar to words having the same meaning of the Chukchi (reindeer men) of the vicinity of Plover bay; one (certainly, and probably two) is of Hawaiian origin, and is in use on both sides of Behring sea among all the people who have had intercourse with whalers and traders from the Sandwich islands; another is a corrupted Russian word; the rest were not recognized, but were pretty certainly *not* of Eskimo origin. Several apparently were roots reduplicated in a manner characteristic of the jargon, but, to the best of my belief, not so formed in the language as properly spoken among themselves.

Tsau-yū′ may be adopted; at least there is no doubt that such as live near Plover bay so call themselves.

TSAU-YU′.

Reindeer Chukchis of authors.
Chūkchis (variously spelled) of authors, in part.
Reindeer men of the adjacent coast dwellers in conversation with the traders and whalers who know them best by this name.
Tsau-chū of Erman, in part.
Tschekto of Matiushkin, in Wrangell, Sabine's edition, p. 120 (meaning "people").
Tsu-tsin of Stimpson, quoted in Alaska and its Resources.
Tchukchus of Bush, l. c.
Tsau′-yū-at, Dall in R. Geogr. Soc. Proc., l. c.
Kugh-ūkh-tūz-ū-mūt of the Diomede Islanders.
Wandering Chukchis of authors.
Koy-ee′-khit of the Asiatic Eskimo (Cape Chaplin).

Lieut. Nordqvist tells us that the termination *at* or *ate* is merely a plural inflection, and that the first part of the word has the collective signification, and in this I have no doubt he is correct, though until his criticism was made I had not looked thoroughly into the matter.

There is, I presume, little doubt that these people adopt slight distinctive changes in their national name according to their native habitat, or that they are in some way divided into clans or tribes, since competent explorers give slightly different names as the tribal name, yet all with a fundamental similarity. Thus Matiushkin on the Kolyma found *Chek-to;* Erman from some source derived *Tsau-chū;* Stimpson, on Seniavine strait, near Konyam bay, obtained *Tsū-tsin;* the writer, near Plover bay, *Tsau-yū;* Nordqvist for the "sedentary" branch on the north coast, *Chau-chau*, and Shishmareff for the same at Mechigme and St. Lawrence bays, *Chau-chū*, for the term "people," meaning themselves collectively. I am inclined to doubt if the *Ch* should not be more properly *Ts*, as in many American tribes, for instance, *Chinook* and *Chehalis*, which we know should be written and pronounced *Tsinūk* and *Tsihalis*, but which have become permanently crystallized in the language under the former erroneous spelling. Nevertheless, as no one is better qualified to pronounce on this subject than Lieut. Nordqvist, his spelling will be here adopted for the people of the Korak race allied closely to the *Tsau-yū*, but who live as the Eskimo do, along the shores, and possess no reindeer, but derive their subsistence from the sea.

CHAU-CHAU.

Chau-chau, Nordqvist l. c. (north coast).
Chau-chū, Shishmareff l. c. (St. Lawrence and Mechigme bays).
Sedentary or *Fishing Chukchis* of authors, in part only.
Namollos, Pritchard and other authors, in part.
Ciukci of Lieut. Bovè.

These people, according to Nordqvist, live along the Arctic coast from Cape Shelagskoi to East cape, and are of the only race represented by living inhabitants on that stretch of coast. So far as the accounts yet published extend, their mode of life, manners, customs (except some of those relating to religious matters), dwellings and implements, differ in no distinguishable manner from those of the Eskimo of Plover bay or the Asiatic shore of Behring sea. The full account which Lieut. Nordqvist will doubtless publish in time, may afford some discriminating features.

In regard to the people at and south-west from East cape, Lieut. Nordqvist seems to be in some doubt as to their exact status, while maintaining, so far as we learn from Stein, a certain reserve on this point, he nevertheless is represented as asserting that they are not Eskimo and that these Eskimo do not occur north of Cape Chukotsky, but reside chiefly about the Gulf of Anadyr. On the other hand he seems to hold that these people on the west coast of Behring strait are composed of a hybrid mixture of Chau-chau and Eskimo blood which is not recognized as their own race by the former, at least not by such as dwell on the Arctic coast.

The synonymy of the Eskimo tribe or race found on the Asiatic shore is the most complicated of all:

YŪ-IT.

Yūit (people), their own name for themselves, a corruption or shortening of *In-yū-it* or *Innūit*, the universal name of the Eskimo stock except of the Aleuts.
Namollo of Pritchard and other older writers.
Tchouktchi Asiatiques, Balbi, Atlas Ethn.
Tuski, Hooper, Markham and Dall, l. c. provisionally. Perhaps a misapplication and corruption of *Tsū-tsin* which belongs to the *Tsau-yū* race.
Chūk'chi (variously spelled) of various authors, erroneously.
Chūklūk'mūt, Stimpson MSS., Dall, l. c. This is a local name of the tribe or local population of Chūklūk island (Ittygrane or Tchirklook of Rodgers' chart), Seniavine strait, and has been so used by me; cf. Contr. Ethn., I, p. 14, 1876.
Sedentary or *Fishing Chukchis* of authors (in part only).
? Onkilon, Wrangell Journey to the Polar sea. This is, according to Neumann and Maidel, a corruption of

Ang-kali or *sitzende Tschukschen*, or
Ang-kadli, meaning dwellers by the sea, cf. Neumann, l. c., or Stein's article.
Aiguan, Nordqvist, according to Stein, l. c.
Aigwan, Maidel, l. c., pp. 67–68; all of the five preceding being names stated to be applied to the *Yū-it* by the *Chau-chau*, and meaning dwellers by the sea.
Kŏkh'-lit-inūin, partly, of the American Innuit, according to Dr. Stimpson.
Ū-ū-ūt of the St. Lawrence bay *Chau-chū*, according to Shishmareff (? corruption of Innuit).
Em-nūn-ka, *Kăliă-ing-wir*, *Rliă-rlia-ūt* and *Un-wee-ven* (= *Innūin ?*) of the Mechigme bay *Chau-chū* according to Shismareff. The third of these names has a local Eskimo termination and the fourth is probably a corruption of the plural form of *Innūit*.
"*Matsinka*" *men* of the trading jargon, meaning "good" men.

Those living at East cape *(Nŭzwŭkh)* are called by the Diomede Islanders *No-gwȧh-mūt'*. Those living at the Chūklūk village in Seniavine strait call themselves *Chūk-lūk-mūt*.

We have then four groups of people to consider and refer to their true relations, namely, the *Tsau-yū*, the *Chau-chau*, the *Yū-it* and the dwellers between Cape Chukotsky and East cape.

With regard to the *Tsau-yū'* and *Chau-chau* we may accept Lieut. Nordqvist's decision that they are mere branches of one people, the differences between which, it is to be hoped, he will eventually make clear. Both are, without doubt, branches of the Korak (or Kariak) stock, and correspond essentially to the divisions of settled and wandering Koraks described by Wrangell, Erman, Bush and Kennan, the last two of whom—having had more intercourse with both the Koraks and "Tchukchi" than any other explorers for many years—unite in the opinion that there is no essential difference of any kind between the two people, either in life or speech.

As to the region occupied by them, it extends from the Kolyma to Behring strait. Even the *Chau-chau*, or sedentary branch, as attested by Nordqvist, resemble the Innuit in their more or less constant movement, to and fro, between different points, as well as in almost every other respect except language and race.

Only the *Tsau-yū*, by reason of their self-transporting sustenance, the reindeer, are able to make long interior journeys.

The relations of the *Yu-it* to the *Innuit* are not doubtful. No one questions their identity in race and language, though their manners have changed in many respects since they migrated from America to Asia.

Their hunting grounds are confined to the coast like those of the

Chau-chau, and about the south-west limit of them, at least, there is little or no doubt. They are slowly migrating southward along the Kamchatkan coast. In 1865, and for many years previously, their visits to the Anadyr river mouth were few and far between, probably not more than once a year on the average, and they had no village there up to 1866. In 1879 a colony had reached Cape Oliutorsk (according to Capt. Owen of the steam whaler *Mary and Helen)*, and planted themselves and sent word for more to follow them as they "had found a good place." These migrants came from Plover bay, where seal were no longer plenty, and had paddled some five hundred miles.

The northern limit is more uncertain, Lieut. Nordqvist puts it at Cape Chukotsky, which is too far south. On the authority of Capts. Redfield and Smith, traders of many years' experience and who understand perfectly the difference between the races, their languages and the trading jargon in use by both, I placed it at Cape Serdze.

The *Chau-chū* of Mechigme and St. Lawrence bays informed Shishmareff, in 1821, that an Eskimo tribe were living on the Arctic coast who wore labrets. One old man at St. Lawrence bay told how he had traveled to the River Amiluk not far from Cape Chavaka (Shelagskoi), from a point beyond Koliuchin island, without seeing any people. At the cape and on this river were people whom he called *Chāvāki*, who wore labrets like the Americans. At Mechigme bay the same people were alluded to as existing on the Arctic coast, and were called *Eg-liū-nok*. Shishmareff saw at both St. Lawrence and Mechigme bays, people of the *Yūit* race; whom the *Chau-chū* said, lived by themselves along the sea coast, obtaining their living from the sea, kept to themselves, spoke a different language and knew nothing about reindeer keeping. Stimpson, in 1856, obtained a nearly pure Innuit vocabulary at Chūklūk village in Seniavine strait. In nearly every year from 1870 to 1880, Capt. Owen and other whaling masters have obtained Innuit whale fishers from St. Lawrence bay, who stayed by the vessel until she left the Arctic, when they were landed at their homes rich with accumulated stores of salted whale meat and "black skin" to keep them during the winter. In 1880 Innuit came off to my vessel from Cape Chaplin where they have a large village. Their language was almost identical with the Mahlemūt of Norton sound. One

of them spoke English well. He said, in response to questions, that they had little intercourse with the *Chau-chū* except in trade, that their languages were entirely different, but that they communicated by the trading jargon: that the "deer men" were rich and the "matsinka men" *(Yū-it)* were poor. They did not intermarry as a rule; sometimes an Innuit girl would marry a "deer man" chiefly because she would always have plenty to eat and little or nothing to do; but the *Chau-chū* women never married *Yūit*, "they would have to work too hard and submit to seasons of semi-starvation." On the other hand, Cornelius, a native of Plover bay belonging to the Eskimo stock, speaking English with great fluency and correctness, informed me that his people had only a commercial intercourse with the *Tsau-yū*, that the shamans of the former had different practices from their own, and that they never intermarried. I asked him what the "deer men" called themselves. He said *Tsau-yū'-at.* But, said I, at Cape Chaplin they said *Koy-ee'-khit.* "I have heard many names given to the 'deer men,'" he said, "but the only name I have ever heard them call themselves is *Tsau-yū'-at.* The name you say is for making fun of them, it is not their own name." I tried to find out what the meaning was, but he evidently was unwilling to explain, and it is evidently some contemptuous appellation, such as the American *Innūit* give the Indians *(In'-ka-lik)* which means "children of louse eggs." This Cornelius had lived a number of years in the United States, had been in Washington as well as New Bedford. The native of Cape Chaplin who boarded me in the strait had also spent a winter in San Francisco, and was very outspoken in his disgust at the white men who were willing to eat turtle, which he had seen at the restaurants, and which he described as "American devil." Their travels are made as members of the crews of whaleships, where they do efficient duty, but I have yet to hear of a *Chau-chau* who has left his native shores.

I have shown that *Yūit* (Eskimo) extend to St. Lawrence bay. For their extension to East cape, beside the authority of several whalers and traders of great experience, I had a pure Eskimo vocabulary, obtained for me at the Nūwūkh village on East cape, by Capt. Smith, about 1872, which is now in the collection of the National Bureau of Ethnology. This, I think, settles the fact of the existence of *Innuit* at that point as late as 1872, and I see no reason for doubting that they still exist there. That occasional

parties at the time of the walrus hunt (June) proceed along the coast as far as Cape Serdze, I believe, though the only information I have is derived from several whalers, notably Capt. Owen, who was boarded by them in the autumn of 1879, at nearly the time that the *Vega* was frozen in, and not over fifty miles from that vessel, which was reported to Capt. Owen in such a way that he suspected it to be the *Vega*, and sent a letter by the first party (whom he paid with a large quantity of hard bread, etc.) offering assistance if needed. This letter, however, some time afterward was brought on board his own vessel by a second party of *Innūit*, who demanded large pay for its safe delivery.

The possibility, or probability, of parties of *Innūit* making their way along the Arctic coast at certain seasons does not affect the fact asserted by Lieut. Nordqvist, that the generality of the inhabitants, and perhaps the only permanent inhabitants of that coast, are *Chau-chau*. We know that there are large numbers of the latter at St. Lawrence bay, and doubtless there are also at other harbors on the west shore of Behring strait, including that at East cape, living on perfectly amiable terms with the *Yū-it*.

At Plover bay they do not inhabit the same spot, though near neighbors. I saw an old *Tsau-yū* shaman in 1866, who had come all the way from Anadyr bay to perform certain rites of sacrifice on some of the ovals of upright stones on the hill near the anchorage. He was accompanied by several of his compatriots, while the *Yū-it* clustered round, interested spectators of a rite they did not join in.

Several *Chau-chau* were residents of Cape Chaplin, though most of the natives there were *Yū-it*. Old "Enoch" was one who received each year until his death, a number of casks of strong liquor from the traders, for which he faithfully accounted the following spring.

A word may be said as to the jargon of which I have spoken. It is similar in some of its constituents to a jargon used on the shores of Norton sound and at Kotzebue sound. That is the corrupted Russian, Hawaiian and English words are much the same, but on the Asiatic side there is a large admixture of words of Korak (Chukchi) extraction. *Kau-kau*, corrupted Hawaiian for food, "grub," eatables generally, is in common use on both coasts. *Shawak* or *Chopak*, corrupted Russian for dog (sabak) is in use on both coasts. Many of the words consists of a redupli-

cated Korak or Innuit root which is used with little or no inflection, while in the original tongues reduplication is extremely rare and the roots are always inflected. Many of these words have an abstract meaning which does not exist in the native dialects, as for instance "*kau-kau*," food. In the dialect of *Chau-chau* and *Innūit* alike, there is no abstract word for food known, but there are special names for each kind of food, which are always used in speaking among the speaker's own people. This jargon was in use, I have reason to believe, in some shape between the *Innūit* and *Tsau-yū*, long before the advent of the whites, but when traders came it was soon amplified by new words for things previously unknown, almost always modified from their original pronunciation by the unaccustomed native tongues (as 'Myr-kan for American; chopak for sabak; tāwā'ka for tobacco, etc).

The confusion can only be cleared up by trained linguists. Ordinary explorers cannot be expected to be qualified for the task. The vocabularies obtained by them will almost certainly be infected by jargon, if indeed not wholly composed of it. Even with the great care doubtless exercised by Lieut. Nordqvist and his companions, I should feel little hesitation in predicting that their vocabularies will be found to contain a certain admixture of Eskimo words, which could be picked out by an expert.

Now if this be the case (and we shall doubtless learn in good time about it), since the mode of life, the general features of physique and the jargon used by both races differ but very little, according to the reports from the *Vega* and the experience of others, how can we say dogmatically that the Innuit are not at any time to be found on the Arctic Siberian coast, until the several villages and their inhabitants have been examined in greater detail than has yet been possible?

I will conclude by noting that the *Innūit* of the American and Asiatic shores of Behring strait are not on good terms with each other. They are not actually at war, as in the time of their discovery by Popoff and Deshneff, but they cherish a mutual contempt. The "*Mātsin'kā* men" of Asia despise the "*Nakū'ruk* men" of America. The inhabitants of the Diomedes, who do most of the intertrading, warned us, in 1880, against the "bad men" of East cape. The Plover bay natives *(Yūit)* were outspoken in their contempt for the American *Innūit*.

The long journeys from Asia to America formerly performed

by the natives, are now unnecessary on account of the visits of traders to both shores, and are seldom or never undertaken. The Diomede people, however, visit both shores and carry liquor from Asia to America. The increasing scarcity of food is impelling a southward migration as previously mentioned, and it may not be many years before the native Eskimo population of Asia may be located where Lieut. Nordqvist at present has somewhat prematurely placed them, namely, to the south and west of Cape Chukotsky.

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THE LENGTH OF LIFE OF BUTTERFLIES.[1]

BY W. H. EDWARDS.

SOME inquiries on the subject led me to investigate the matter, and to refer to my note books, in which are recorded everything that has come under my observation relating to butterflies for the past fifteen years.

Boisduval, and Kirby, and Spence allege that the life of the summer butterflies is brief, the male expiring soon after copulation, the female after oviposition. On the other hand, Mr. Scudder has spoken of butterflies living two to three months. Mr. Edwards expressed the opinion as to the hibernating butterflies, that they lived from about the 1st of September to the end of the following May, or eight to nine months at the outside. Whereas Mr. Scudder asserts that *D. archippus* lives from a year to fifteen or sixteen months.

Observations show that one brood follows another in rapid succession in many species at the South, a month sufficing for the complete duration of the generation. As the emergence of individuals from the chrysalis is not all at once, but is continued through several days or weeks, it follows that the life of any individual butterfly must be much less than the duration of its generation; certainly not over one-half to two-thirds that of the generation. In the case of polymorphic species like *Papilio ajax*, it is not difficult to fix the duration with some definiteness. Mr. Edwards gave from his note books dates of the first and last appearance at Coalburgh, W. Va., of the form *Ajax walshii* and of the form

[1] Abstract of a paper read at the Cincinnati Meeting of the American Association for Advancement of Science.

Ajax telamonides, and showed that an individual life could hardly be more than two to three weeks. It was stated that not only in this species but in most or all which had come under observation, it is the old males which mate with the young female as soon, or nearly as soon, as she emerges from the chrysalis. These old males are on the watch, flying about everywhere, and seize the young female, often before her wings are dry, and hence before the young male, if emerging at the same time with the female, would be strong enough to take part in the copulation. Consequently it happens that many of the males are unable to find mates, and these males are the longest lived. The last butterflies of the generation are often seen to be old males, who probably have never mated.

Similar conclusions as to the duration of life were drawn from observations on the polymorphic species, *Lycæna pseudargiolus* of which *L. violacea* is the early form.

For an example of the hibernating species, the history of *D. archippus* was detailed. It is three or four brooded in West Virginia; the old females die in May after laying their eggs. These eggs produce the first generation of butterflies of the year, and the females of this lay eggs which produce the second generation, and so on to the end. The eggs are always laid by females plainly not long from the chrysalis. We have carefully watched this species all through the year 1878, and had given the results as briefly stated here in *Psyche*, Dec., 1878. This was because Mr. Scudder, in *Psyche*, July, 1875, had represented Archippus as having habits unlike any other butterfly, in that it was single-brooded over North America, and not double brooded; that it left its winter quarters late and continued on the wing the rest of the season, laying eggs all the time, so that the caterpillars to be found all along through the season were produced by its eggs, *instead of coming from the eggs of young females.* The young females in fact could not lay until they had passed hibernation. It will be seen that such behavior involves a radical change of habits of the race, wherein this butterfly, laying eggs at intervals for months, approaches the mammals.

Mr. Scudder recently repeats this story in his "Butterflies," 1881, without note or comment or any additional data, or any verification at all, and hence Mr. Edward's paper.

NOTES ON THE MIGRATIONS OF BIRDS.

BY H. D. MINOT.

LITCHFIELD is in the highland of Western Connecticut, from nine hundred to twelve hundred feet above the sea, somewhat sparsely wooded, though well watered by southerly streams, running either into the Naugatuck valley or into the system of Bantam lake (the largest body of fresh water in Connecticut, with an area of about twelve hundred acres). My observations there extended from October, 1880, to May, 1881, inclusive of both months, and suggested to me, concerning:[1]

(1) Pioneer migrants: that the single temporary forerunners of a species, so often observed among early non-gregarious migrants before the arrival of their fellows in numbers, may serve more than a purely individual purpose. A single record will illustrate: April 1st I observed by a particular bridge the first pewee, dejected, silent or petulant, and hurried, soon flying out of sight *southward;* for a week no pewees were to be seen or heard there or anywhere about; April 8th was pewee-day, bringing these birds in numbers, and at the bridge appeared a triumphant pewee with his mate.

(2) Local differences of time.—Migrant cat-birds appeared in outlying swamps a week or more before the resident cat-birds returned to their village home; and king-birds appeared down

[1] Before remarking on migrations here, I append the following dates of arrival: March 12, blue birds (in numbers); 15, song sparrow, *snow bird*, fox sparrow, red-winged blackbird and rusty grakle; 25, meadow lark; April 1, the first pewee; 3, horned larks; 9, downy woodpecker; 20, white-breasted swallow, Savannah sparrow, bay-winged sparrow, cow bird and kingfisher; 22, hermit thrush; 23, red-poll warbler, martins, swamp, field and chipping sparrows, yellow-bellied woodpecker (among hemlocks) and golden-crowned kinglet (absent latterly in winter); 24, ruby-crowned kinglet (singing), yellow-rumped warbler, barn swallow, solitary vireo, and purple finch, and goldfinch (after a long absence); 28, brown thrush, creeping warbler (*Mniotilta*), white-throated sparrow (earlier?) and towhee; May 1, orchard flycatcher (*Empidonax minimus*—the first appeared April 27); 3, Swainson's thrush (a pair in a pasture (!) by a rill), cat-bird, oven-bird, yellow warbler, and king-bird; 5, house wren; 6, Wilson's thrush and redstart; 7, warbling vireo; 8, chestnut-sided warbler, Maryland yellow-throat, Baltimore oriole (abundant next morning), "night hawk" (in the village) and wood thrush (probably); 9, Nashville warbler, "blue yellow-back," etc., red-eyed vireo, rose-breasted grosbeak, bobolink and Traill's flycatcher; 10, wood pewee and whippoorwill; 12, cedar-birds; 13, yellow-throated vireo and black-and-yellow warbler (or earlier); 14, scarlet tanager; 15, black-billed cuckoo, and so on. Blue birds had eggs in the last week of April; robins and pewees began to lay about May 1st.

by the lake, three miles off, several days before advancing to the outskirts of the much higher village. *The most favorable haunts are the first revisited.* Local differences of season, too, are very considerable: April 30, a visit to Bethlehem, nine miles southward, showed a week's advance.

(3) The great influence of season and the comparatively little influence of temporary weather (except on water fowl).—Crows moving southward in large bodies in the latter part of October, predicted to me a severe winter. It proved one of extraordinary and almost uninterrupted severity, without any midwinter thaw. In the first week of March these crows returned (three hundred debating one afternoon whether to roost in Litchfield woods or to pass on), our first spring weather forthwith followed, and real winter did not reappear. Snow-birds *(Junco hyemalis)* were absent all winter, following southward the unusually extended and steady line of frost and snow; and nuthatches and most of their kindred were absent during the latter or stormy part, marked especially by ice-storms. On the other hand, some warblers, after a month of bright, lovely weather, waited to appear in the face of the cold, blustering, lasting northeaster that set in May 16. In spring, moonlight is taken advantage of by birds like water-fowl, that make long voyages in long flights; but it affects little our insessorial birds, who, however much they may profit by the harvest moon in autumn, in spring are more strongly impelled to migrate, and reappear pretty regularly, independently of the lunar calendar. For instance, at home I have noted the arrival of a particular pair of Wilson's thrushes year after year, between the 5th and the 10th of May, often coming apparently in the night, however young or old the moon might be. No doubt, however, as I have even detected sometimes, migrants that seem to have come in the night, often arrive in the evening, simply traveling till a late hour of the day before resting, and the next morning may linger for refreshment before resuming their journey. In building, on the contrary, activity is in the morning.

(4) The uncertain order of species.—In spite of pretty regular habits of migration among the later comers, accidental circumstances produce such variations that there is no certain order or procedure among the different kinds, even near relations. Whether the chipping or the field sparrow (Spizellas) will appear first in a given locality where both are common, who can safely predict?

(5) The routes of New England migrants.—In visiting Lenox, Berkshire county, Massachusetts, several years in April, I have been astonished to find that though so high (1200–1300 feet above the sea), and in spring so bleak and backward, it gets some of its birds (for instance, bay-winged and chipping sparrows) before either Boston on the coast or Litchfield, lower and over forty miles more south—as I have determined by returning to these places from Lenox, and making immediate comparison. 1881—Bay-winged sparrows in full song at Lenox, April 16; I returned to Litchfield two days later, but found none till the 20th. The configuration of the country, in connection with such observations, seems to show that many birds follow the coast and rivers, ascend broad valleys sooner than narrow, and thence spread up the slopes and hills, perhaps escaping occasionally through gaps where water-courses nearly meet, from one basin to another. Therefore migrants, especially those hurrying, are comparatively few, or wanting, along high ridges—as exemplified at Litchfield by the scarcity in spring of warblers of the Canadian fauna.

(6) The effects of elevation on the ornithological calendar.—Though comparisons of full value should be based upon simultaneous and repeated observations, I venture the conclusions (illustrated by my list of dates, based upon daily search) that Litchfield, as compared with Boston, is, from its elevation, backward in its spring, and in getting the earlier migrants, but that when, after a few hot days, it suddenly gets its summer with wonderful rapidity, it gains from being nearer the south-west sources of migration, and gets its later resident birds—for instance, the wood pewee—sooner.

(7) Local variations.—Such are the autumn congregation of over a dozen golden-winged woodpeckers in a flock, and the singing of field sparrows and of redstarts here often with a falling instead of a rising inflection. Such specific variations as red-winged blackbirds, in their spring chorus, congregating commonly in one tree, while the rusty grakels often each take a tree top or limb for himself, and such individual variations as a nuthatch cracking open a hard nut (probably for a maggot) are also curious.

I subjoin here, though the evidence is not complete, the records of a Tennessee warbler, May 6, 1881, and of a black-and-yellow warbler nesting. Martins, a gentleman here tells me, kill interlopers of their own species, cracking the skull.

SOTOL.

BY DR. V. HAVARD, U. S. ARMY.

Name.—This interesting member of the Liliaceæ has been described under different names; it is the *Dasylirion texanum* Theele, of Watson's "Revision of the Liliaceæ," and the *Dasylirion graminifolium* Zucc., of Torrey's Botany of the Mexican Boundary Survey. It appears to me that the *D. wheeleri* Watson, may not be specifically distinct from it.

Sotol is the Mexican name under which it is well known along the Upper Rio Grande, and bear-grass its common, meaningless Texan appellation.

Description.—Perennial, characterized by a thick tuft or cluster of long, green, armed leaves, from the midst of which rises, periodically, a stout stem ten or twelve feet high, bearing a long, close panicle; caudex none or rarely, in old plants, six to eighteen inches high; leaves very numerous, roughly estimated at four or five hundred, erect in the center, thence gradually spreading to the ground, their expanded, white, ladle-shaped bases four or five inches long, three or four inches wide and two lines thick, ending rather abruptly into the long, narrow body of the leaf with which it contrasts sharply in color; at the point of transition is a pair of thin, coriaceous wings; leaf, exclusive of the base, three to four and a half feet long, seven to ten lines wide below, gradually tapering to a point which is split into coarse fibers; armed on both sides with teeth hooked downwards, very variable in shape, size and relative distance mostly two lines long and six lines apart, often tinged with violet at apex or throughout; edges between the teeth finely serrated; panicle two or three feet long; partial panicles three to four inches long, erect in the female plant, flexuous and pendant in the male, subtended and often overtopped by broad, lanceolate bracts; fertile racemes two to four, staminate racemes only one to two inches long; fruit three-winged, broadly oval or subcordate, three lines long, on pedicels hardly one line long; the narrow wings less than one line wide, sometimes free, generally more or less adnate to the style, straight or diverging but seldom rising above it; seed triangular pyramidal with obtuse apex, 1 line long and broad, minutely ruguiose under a lens; embryo slender, cylindrical, in the center of a horny albumen as long as the seed.

It may be seen that this description differs from that of authors in some particulars, such as the absence of any conspicuous caudex, the larger size of the leaves and hooks, and the variable degree of adnation of the wings to the style in the fruit.

The bear-grass produces a fructiferous stem every three or four years, when sufficient material has been accumulated in the succulent leaves. It is mainly propagated by seeds shaken off their stately support by the wind and carried away in various directions; the young plant grows rapidly and shoots its first stem when four or five years old. It blossoms late in summer and the seeds ripen in the fall; most of them remain on the stalk all winter, and many persist until late in the ensuing year.

Habitat.—The home of the sotol is Western Texas, Southeastern New Mexico and Northern Chihuahua. Proceeding westward from San Antonio, I first met it after crossing the San Pedro or Devil's river; beyond the Rio Pecos it becomes abundant, covering almost exclusively square miles of arid and stony slopes, beyond question the most striking botanical feature of the country. It extends west, probably to the Colorado. If specifically it includes the *D. wheeleri* Watson, it is the prevalent Dasylirion of Southern Arizona.

The sotol grows best at a certain altitude, five or six hundred feet above the level of the Rio Grande, that is to say, above the region of the *Yucca baccata* and the lower line of the *Agave lechuguilla*, on nearly all the foot-hills of Western Texas. It thrives in dry, rocky soil where no grass can grow, and sometimes, insinuating its long, filamentous roots into invisible fissures, seems to spring from the living rock.

Uses.—The first experience of the traveler with the bear-grass, whose hooks scratch and tear everything they touch, is a disagreeable one; but further acquaintance with frontier life makes him consider it one of the beneficent provisions of nature. In some of our camps, where other fuel could not be procured, we made good fires of the old stems of this plant. These are sufficiently strong and long for use in building the walls and roofs of huts or Mexican jacals. As a fiber plant the sotol is worthless; even if it were possible, with the defiant hooks, to scrape off the fibers, they are too few and weak to be serviceable.

The base of the leaves and the young stems are full of a sweet, refreshing and nourishing saccharine matter which supplies food

and drink; no one need suffer from thirst or hunger who finds a tuft of bear-grass and has a long handled knife or an axe with which to overcome it and cut off, as low as possible, some of the central leaves; often these can be torn off by pulling them with a twist at the unarmed apex. The nutritive saccharine substance lies mostly in the white, expanded bases which always give to the test a large proportion of glucose. These bases are closely and compactly imbricated into a bulby expansion or "head," from which the leaves proper seem to grow; this head, trimmed down to the white, fleshy moss, is ready for use either on the road, in the Mexican kitchen or by the mescal manufacturer. For eating, it can be boiled, broiled or baked, previously, if convenient, cutting an axial hole through it to render the cooking more rapid and thorough. Broiling on coals takes an hour or less. Baking, the usual mode of preparing it for food, is done in an oven or, if in the field, in a small heated pit where it is kept about twenty-four hours, or until it has acquired a rich brown color. The scales are detached and eaten as needed after pealing off the thin epidermis covering both sides, or again they may be ground into atole. Their sweet taste, not unlike that of molasses, reminds one of the "mescal" of the Arizona Apaches, that is, the baked head of the *Agave palmeri* and *Agave parryi*. This, however, differs from the sotol head in being much smaller and consisting mostly of the thickened top of the rootstock, so that its solid, homogeneous mass can be cut in slices like a cake.

Sotol mescal.—The main and paramount use of sotol is in the making of a spirituous liquor known as "mescal" along the border, but in the interior of Mexico, to avoid mistaking it for a similar product from maguey, called sotol mescal. This fabrication is carried on mostly in the Mexican States of Chihuahua, Cohuihuila and Sonora, and sotol mescal is the ordinary alcoholic beverage of the native population. It is precluded in Texas by the high duties laid on this class of industry.

The distillery, or vinata, is located in foot-hills, near water, and in the midst of a perennial crop of bear-grass. Trains of burros bring in every evening their loads of heads; these as trimmed by the axe of the peon and ready for the oven, are subconical in shape, twelve or fifteen inches high and broad, and weigh from twenty to twenty-five pounds; they attain much larger dimensions in favorable localities, and a vinata proprietor has even

assured me that it is not uncommon to find them measuring two feet or more in diameter and weighing as much as seventy-five pounds. All heads seem to be good for the purpose, even those with a growing stem are not spared, though they doubtless contain less sugar, and the cutting is only suspended by the floods of the rainy season, from June to September, during which period the vinata is closed, and the mescal bibber constrained to reform; now also is the time to shift the establishment, if needs be, to a more abundant field of sotol.

The oven in which the heads are baked is a circular pit about ten feet in diameter and depth, and lined with rough stones. Into it combustibles are thrown and a brisk fire kept up for one day; it is then cleaned, filled with heads and lastly covered with a roof of hay and earth well 'trodden' down. In three days the baking is through; the heads are now chopped with hatchets and the fragments pounded into a coarse, shreddy pulp, which is thrown into vats four or five feet square, to undergo fermentation; in cold weather warm water is added, otherwise it does not appear to be necessary. During the first few days bare-legged men tread in the vats to stir and mix the pulp. In from six to ten days, according to season, the fermentation ceases and the contents of the vats, solid and liquid, are transferred to the still. The first liquor obtained, being richer in alcohol and possessing to a higher degree the peculiar aroma of sotol mescal, is considered of better quality. The used-up leaves, still sweet to the taste, are fed upon with relish by the donkeys, hogs, dogs and chickens of the vinata.

A rough calculation makes me estimate at one pint the quantity of liquor obtained from one average head; the yield would doubtless be much greater if, instead of roughly pounding the baked heads, they were crushed into a fine pulp by appropriate machinery. A vinata in good running order will turn out a Mexican barrel a day (about twenty-eight gallons), sold at an average price of fifteen dollars, and retailing for thirty or forty cents a quart. The revenue laws of Mexico, exceedingly severe on articles of prime necessity, are very lenient on the vinatas, which, if first-class, are only taxed fifty dollars a year.

The liquor obtained from the sotol is limpid and colorless, its smell penetrating and its taste, *sui generis*, somewhat raw, pungent and bitter, but with a pleasant aroma not unlike the smoky

flavor of Scotch whisky. Its percentage of alcohol is about that of whisky, perhaps a little higher; it burns readily with a yellowish, purple flame, leaving an intensely bitter residue, and gives an acid reaction with litmus paper.

Sotol mescal is a pure, wholesome alcoholic drink; if the best brand be kept long enough to lose its sharp edge, it compares favorably with good whisky; Mexicans prefer it, and with reason, to the ordinary frontier whisky, and the American toper takes kindly to it if the latter be not readily accessible. On account of its cheapness and characteristic taste, mescal is very seldom adulterated. As far as I have observed, it has no peculiar effect upon the system; stomach, liver and kidney troubles, which might be referred to its action, are very rare, nor do the acid, pungent and bitter elements, contained in it, seem to affect any of the organs unfavorably. In the parlance of the toper, and to his thinking no mean advantage, there is much less headache in it than in whisky.

This sotol mescal should not be confounded with maguey mescal, or tayuile, the product of the maguey plant, *Agave americana*, and the liquor perhaps more generally known under the name of mescal in the United States; it is extensively manufactured in the interior Mexican States from the abundant sap collected in the cavity made by removing the young central leaves. Although much like it in taste and effects, it is a finer article than the former and commands a higher price.

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THE FAUNA OF THE NICKAJACK CAVE.

BY E. D. COPE AND A. S. PACKARD, JR.

THIS cave is situated near that point of the southern boundary of Tennesse where it is joined by the line which separates the States of Georgia and Alabama. In dimensions it ranges with the Mammoth and Wyandotte caves of Kentucky and Indiana, whose faunæ have already been described in earlier volumes of the NATURALIST. Many miles of galleries have been explored, and no end has yet been reached. The entrance is in the northern side of a hill, not far from the road that passes on the south side of the bottom of the Tennessee river. It is of much more imposing proportions than that of either of the caves already mentioned. The visitor climbs the hill from the road, following

a path which leads along the high bank of a considerable creek. The entrance has a wide floor which is cut by a gorge at one side, through which the stream just mentioned, issues. The roof is flat and is overhung by vegetation. The following pages record the results of two collecting expeditions made there by Professor Cope.

Near the mouth of the cave a salamander of the genus *Plethodon* was found, which is very peculiar. Instead of the black color with or without pale bluish dots, of the *P. glutinosus*, the sides and back are thickly spotted with large irregular yellowish-green blotches of irregular form, producing an effect something like the coloration of the Mexican *Spelerpes leprosus*. The dorsal spots are much larger than the lateral, and are often confluent. On the head they almost exclude the ground color. In addition to this color peculiarity, the feet differ from those of the *P. glutinosus*, in the rudimental character of the inner digit, both anteriorly and posteriorly. It is represented by metapodial bones only, having no phalanges. There are thirteen costal folds, one less than in *P. glutinosus*, and the vomerine teeth do not extend beyond, or even to, the internal nares. The tail is round and rather slender. Length to axilla, .020; to groin, .051; to end of tail, m. .122. This species is about the size of the *P. glutinosus*, and as it is distinct from it, we propose that it be called *Plethodon æneus* Cope.

In company with it was found the smaller *P. cinereus*. Then there was a small scorpion; a *Polydesmus*, and some other centipedes, and a beetle like *Scarites*, but larger than the common northern species. Snails, as in other limestone regions, are abundant.

On entering the mouth of the cave abundant traces of former human habitation are found. These consist principally of charcoal and remains of shells—as Ios and Unios from the Tennessee river, brought there by the Indians as food. The creek was formerly dammed at this point and supplied water to a mill at the mouth of the cave. This was grinding the grain of the neighborhood at the time of the first visit, but had disappeared by the second. Fishing was attempted from this point far into the depths of the cave. The results were chiefly Crustacea, which are described below. No blind fishes were seen or taken, but some fishes of the outer world were caught at a point where

a very little light from the mouth was distinguishable. These were the common blob, *Potamocottus meridionalis*, and sucker, *Catostomus teres*.

At a distance of a mile from the mouth, the blind crawfish, *Orconectes hamulatus*, began to be abundant; their snowy white forms being readily distinguished by candle light in the clear water.

On the land the *Spirostrephon cavernarum* proved to be common in some places, especially near to bat excrement, where were also found a number of Pselaphid beetles.

On examination of the aquatic cave life, it appears that of the five kinds of animals found living in the waters of the cave, all but one differ decidedly from those of the caves of Kentucky, Indiana or Virginia. This is a matter of considerable interest from an evolutional point of view, as it shows that these cave forms are the descendants of different out-of-door species from those of the caves to the northward. The Nickajack cave may be in a different faunal region from the Mammoth or Wyandotte caves, and thus the blind crawfish has perhaps originated from a different species of Cambarus than that which gave origin to *Orconectes pellucidus*. Thus while the conditions, such as dryness and temperature, of cave life are much the same throughout the United States, the ancestors of the different cave animals were, in most cases, distinct, since they belonged to somewhat different zoö-geographical areas.

The first animal to notice, and one not uncommon in the waters of the cave, is a little Isopod Crustacean which is evidently a modified Asellus, or water wood-louse, of the same genus as that so abundant in the caves, subterranean streams and wells of Indiana and Kentucky. We originally described the Mammoth cave form as *Cecidotæa stygia* Packard; our new species may be called *Cecidotæa nickajackensis* Packard.[1]

[1] It is eyeless, and the body is longer, narrower and slenderer than in *C. stygia*. The first antennæ are very long and reach to the end of the third joint of the second antennæ; they are nearly twice as long as in *C. stygia*, and are purplish white, while the flagellum is provided with long hairs. The second antennæ are as long as the head and extend backwards as far as the base of the abdomen. The legs are much longer and slenderer than in *C. stygia*. The abdomen is long and narrow, and the caudal appendages are moderately long in one specimen and short in another; in one individual the outer branch is much shorter and smaller than in the others, and in most it is as long as the basal joint. On the whole the caudal appendages are no longer than the telson or terminal segment of the abdomen, while in *C. stygia* they are half as long as the entire body. Length 6 mm.

This species forms, in the antennæ and slightly purplish color and the proportions of the leg-joints, perhaps a nearer approach to the genus Asellus than that of Mammoth and Wyandotte caves; on the other hand *C. stygia* approaches Asellus more in its shorter, broader body, with the shorter, broader abdomen. It seems quite evident that the two species must have descended from different species of Asellus. Thus far we know of but one species of Asellus, *A. communis* of Say, from the Middle and Northern States; whether there is an additional species in the Gulf States from which the present species may have been derived, remains to be seen.

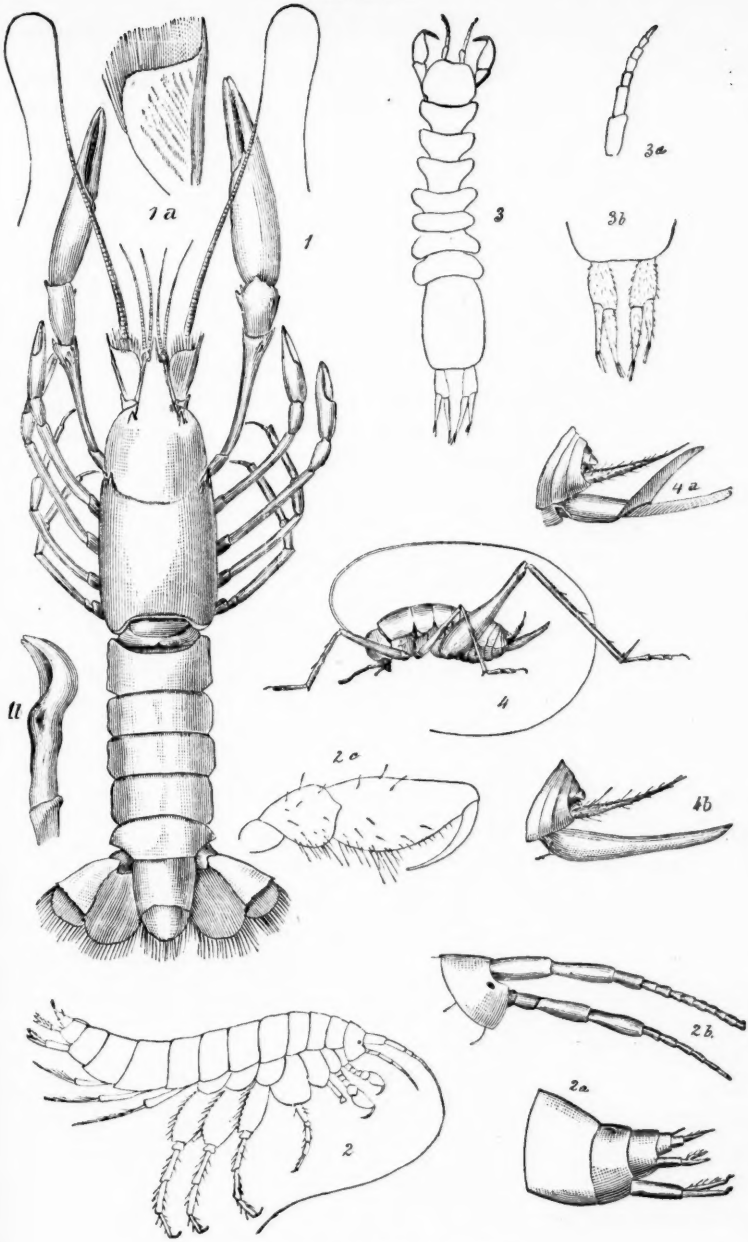
The genus Cecidotæa differs from Asellus in the larger and much longer head, the longer claw of the first pair of feet, the much longer telson, and in the rami of the caudal appendages being of nearly equal size, while in Asellus one is minute; it is also eyeless. The *Asellus borelii* of the Swiss lakes belongs to *Cecidotæa.*

The second crustacean discovered swimming about in the subterranean stream, was a species of Amphipod belonging to the genus Crangonyx, and which may be called *Crangonyx antennatum* Packard.[1] It is a large purplish species with very long antennæ, and distinct, well developed black eyes. This genus occurs in caves and subterranean wells in Europe and this country.

The form of most decided interest, however, is the blind craw-

[1] It is a larger and purplish species; the first antennæ very long; the flagellum with 20–24 joints; the entire antenna being over one-half, and nearly two thirds as long as the body; the last joint of the peduncle being slightly more than half as long as the penultimate joint. Compared with *C. gracilis* Smith, from Lake Superior, it differs in the form of the eyes, the longer and stouter first antennæ, the flagellum having a greater number of joints, and in the different proportions of the joints of the peduncle; the second joint of the latter being much longer than in *C. gracilis*, while the first joint of the scape is much longer, and the second and third joints one-third longer in proportion than in *C. gracilis.* The fourth pair of epimera are unusually large and nearly square. The telson, together with the caudal stylets is much as in *C. gracilis*, but the rami are slightly stouter and more polished, and the spinules a little stouter. It probably is a little larger species than *C. gracilis*, the specimens being 6–7 mm. in length; the eyes are not so distinct and are only one-fourth as large as in *C. gracilis.* It is very different from *C. vitreus* Cope, of Mammoth cave, and from *C. packardii* Smith, differing in its distinct eyes, and larger, more numerously jointed antennæ.

PLATE VII.



THE FAUNA OF NICKAJACK CAVE

we are to look for the ancestors of *Orconectes hamulatus*. On the other hand, in the form of the body, of the scale and rostrum, as well as of the upper lip and the chelæ (though not of the gonopods), *Orconectes hamulatus* approaches *Cambarus affinis*. Now of all our North American crawfishes, it would appear, as Mr. Uhler has told the writer, and as seems evident to us upon an examination of several types and the excellent figures of Dr. Hagen, that *C. affinis* is the more generalized form, and this is tantamount to saying that it is the ancestral form of our North American crawfishes. So while our Nickajack blind crawfish may have been an immediate derivative of *C. latimanus* of the Gulf States, it probably ultimately originated from *C. affinis*, a more wide-spread species.

It is also of interest to note that *O. hamulatus* presents the same generic characters as *O. pellucidus*, the eyes being rudimentary, functionless, the body long and the appendages slender; we thus feel justified in separating the genus from Cambarus.

Of the two crickets found in Nickajack cave, there were three small specimens of *Hadenœcus subterraneus* Scudder, which only differed from Mammoth cave individuals in having rather shorter, thicker maxillary palpi; but this is not even a varietal difference, as the antennæ and legs have the same proportions. The other cricket is a new species of Ceuthophilus, and may be called *Ceuthophilus ensifer* Packard.[1] It is very nearly allied to *C. stygius* of Mammoth cave, but may be distinguished by the characters given below.

EXPLANATION OF PLATE VII.

FIG. 1.—*Orconectes hamulatus* Cope, twice nat. size. 1 *a*, antennal scale, enlarged; 1 *b*, first gonopod.

FIG. 2.—*Crangonyx antennatus* Packard. 2 *a*, end of abdomen and appendages; 2 *b*, head with base of upper, and entire lower antenna and eyes; 2 *c*, claws; all enlarged.

FIG. 3.—*Cecidotœa nickajackensis* Packard (only one pair of antennæ drawn). 3 *a*, upper or smaller antennæ; 3 *b*, end of telson with the caudal appendages; all enlarged.

FIG. 4.—*Ceuthophilus ensifer* Packard, nat. size. 4 *a*, end of abdomen, with the outer rhabdite or blade of the ovipositor bent up to show the shape of the toothed ovipositor, the six teeth are not well shown by the artist; 4 *b*, the end of the body with the ovipositor. J. S. Kingsley, del.

[1] This species differs from *C. stygius* Scudder, of Mammoth cave, by the much more pointed sabre-shaped ovipositor, its tip being long, slender and acutely curved, with six smaller teeth, there being but five in large individuals of *C. stygius*, in which the ovipositor is blunt, and the tip obliquely truncate, while the hind femora are a little longer. The eyes are as well developed as in *C. stygius*. The color and marking are much the same in the two species, both being thickly spotted with black-brown; *C. ensifer* has darker colors and more distinct spots than *C. stygius*, though the latter grows to a larger size. Length of whole body, not including the ovipositor, 22 mm.; length of ovipositor, 8 mm.; of hind femur, 20 mm.; of hind tibia, 20 mm. It differs from *C. lateus* Scudder and *C. sloanii* Packard in the longer legs, and can only be confounded with *C. stygius*.

EDITORS' TABLE.

EDITORS: A. S. PACKARD, JR., AND E. D. COPE.

—— The International Geological Congress and the Zoölogical Society of France have recently adopted rules for the regulation of nomenclature in the systematic biological sciences. These resemble, in most respects, those previously adopted by the British and American Associations for the Advancement of Science. After reading them, we wish to signify our approval of them, with one slight modification in each.

The gist of the whole matter lies in the interpretation of the law of priority. The above-mentioned rules all agree that priority rests on definition, both for generic and specific names, but the rules of the congress and of the zoölogical society add some conditions which we wish to note. The rules of the former body say (p. 121): "For specific names priority shall not be irrevocably acquired until the species shall have been not only described but figured." Our objections to this doctrine have been fully set forth in an editorial in the July NATURALIST. They are two. The first is, that anything which may be taken as a substitute for a characteristic and analytical description is objectionable. Intelligent and intelligible descriptions are more needed than figures, and they are entitled to especial recognition when they are produced. Second, illustration is not always within the reach of naturalists, especially out of Europe. We do not wish, however, to be understood as detracting from the importance of iconography.

The rules of the zoölogical society say: "The name used for each genus and each species can be no other than that by which it was first designated, on condition: *a.* That it shall have been issued in a publication where it shall have been clearly and sufficiently defined; and *b*, that the author employs the binominal nomenclature." Our criticism is here directed against the language "clearly and sufficiently defined." While insisting on description as a basis of nomenclature, we cannot be very exacting as to the quality of the description. "Sufficiently" described, that is without defect or excess, is a perfection which few specific or generic descriptions can present in that stage of a science in which they first appear. This requirement is impracticable. "Clearly" defined these groups can and should be, although the diagnosis may be imperfect, but who is to decide when the degree of clearness is sufficient to satisfy this rule? This requirement

also cannot be carried into practice, however much we may desire the reverse were true. Nothing remains but that we accept any description and diagnosis, and when these fall below the standard set by our French colleagues, let the critic and reviewer use their best endeavors that such defects be made as odious as possible.

In the Proceedings of the U. S. National Museum, Professor Gill insists on the adoption of a generic name proposed by himself without description, in preference to a name proposed later, by another author, whose description contains some errors. The opposite course had been pursued by Professors Jordan and Gilbert, a circumstance which gives rise to the criticism in question. Professor Gill admits the facts to be as above stated, and thereupon makes the following remarks: "What is the advantage of any description? According to the rules of the British and American Associations for the Advancement of Science, a description is necessary as the basis of permanent nomenclature, but like many of the other rules propounded in those codes, there is no proper logical basis therefor." Professor Gill then proceeds to make the usual statements about the inadequacy of the earlier generic descriptions, etc., a mode of reasoning generally resorted to under similar circumstances.

In taking his position, it is evident that Professor Gill and his school (for he is not alone in his views) have to contend not only with the wisdom of the American and British Associations, but with that of the other bodies above mentioned. It would seem superfluous for us to defend a fortification so strongly held, but the heresy in question has had considerable run in America, and it is fitting that said linen should be washed where it has been soiled.

In brief then, one reason why a description is necessary in adding a new name to scientific nomenclature, is, that science is science and not literature, a distinction occasionally lost sight of by a few writers on natural history. In other words, it deals with things, and not words, and the only connection words have with science, is to represent things. As this cannot be done without a preliminary definition, names alone *(nomina nuda)* do not belong to science at all, but to the arts of composition and literature. Second; the inconvenience of the substitution of literary methods for scientific methods in scientific work, is so great, that scientists have felt compelled to protect themselves against these "literary fellows." By insisting on definitions, these gentlemen are placed in a somewhat embarrassing position. They do not wish to forego the pleasure of creating a new lexicon, but to compose a diagnosis is for them a very serious business. Literature, a critic says, deals with "manner," while science treats of "matter," and a diagnosis is a concentrated extract of matter. Between the two horns of the dilemma he will generally (not always we are sorry to say) prefer the less conspicuous course, and abandon nomenclature as a profession.

RECENT LITERATURE.

SCUDDER'S BUTTERFLIES: THEIR STRUCTURE, CHANGES AND LIFE-HISTORIES.[1]—In this book we have a very successful attempt at a thorough study of the butterflies of a limited region, New England, not only from the point of view of the structure of the winged insects, but also of their transformations; and the author does not stop here, where many books on butterflies would naturally end, but in the light of modern biological science, he leads the student to observe their habits, their seasonal changes and histories, their styles of coloration, the sexual differences in coloring and structure, and the probable reasons for such diversity; then he speculates on the origin and development of ornamentation, on the ancestry of butterflies, and presents a genealogical table which also serves, as it naturally should, as a tabular view of the classification of butterflies in general, and finally he discusses the geographical distribution of butterflies, and in a few last words points out to the student how such a diversified region as New England received its butterfly population, especially how an Alpine summit, such as that of Mt. Washington, was peopled with its Arctic-like forms, the *Œneis semidea*.

In the preparation of these chapters, the author has evidently drawn very largely on knowledge acquired through his individual observations pursued for a number of years. So far from being in any sense a compilation, it is a fresh and original treatment of a most interesting theme, replete with many facts heretofore unpublished and unknown to the scientific public. The presentation of the subject is nearly always clear and simple, and the illustrations are, in many cases, original, and adds materially to the interest and value of the text. There is a good deal of inequality in the figures, the woodcuts, particularly those borrowed from the works of Harris and Riley, have been well printed; but by a false economy a number of figures prepared for photographic reproduction, however originally well prepared by the artist, do not print well, and we do not see how shaded drawings of this kind ever can be made to present a respectable appearance by the side of good woodcuts, though simple outline sketches print well enough.

Without farther enumerating the excellent features of the book, together with its good paper, neat typography and its general usefulness to the student, we will only say that it is a matter of congratulation that so original and stimulating a book has appeared; that it is a credit to American science, and that it is unique in its nature, no such work, so far as we know, being in existence in England, France or Germany.

[1] *Butterflies: their Structure, Changes and Life-histories, with special reference to American forms.* Being an application of the "doctrine of descent" to the study of Butterflies, with an appendix of practical instructions. By SAMUEL H. SCUDDER. New York, Henry Holt & Co., 1881. 12mo, pp. 322, with 201 figures.

The special student of butterflies, and the general student of Lepidoptera, will doubtless find fault with some statements and conclusions in the book. The author divides the butterflies into four "families," which we should regard as sub-families; he splits up genera to what seems to us to be a most extreme degree, and quite unnecessary in a book designed for popular use, where only the leading groups need to be emphasized, and the subordinate groups may be suppressed; why should the old name *Papilio* be given to what every one knows by the name of *Vanessa antiopa*, and the genus *Papilio* cut up into a genus for nearly each species; the rule of priority is an excellent one, but in rare cases, and especially such as this, need not be relentlessly followed. The old genus *Hesperia* has been also remorselessly subdivided. If this was done in the lower families of moths, as it could be on the same grounds, it would result in a burdensome and useless list of generic names. Is it not better to indicate such subdivisions rather by numbers than names; and cannot the systematist leave a little margin for the movements of nature in what at best is a direful straight jacket? We deplore the present extreme tendency to analytical views in classification; and believe that the results of catholic, extended study over different orders and classes of animals, and especially of variations in species and genera, induces more conservative and synthetical methods.

Among minor points which we should indicate, is the account of the development of the embryo on p. 11, which does not seem to us to be either clear or exact; on p. 14 in his account of the mouth-parts of the caterpillar, the author needlessly bewilders the student by speaking of the "astonishing number of moveable organs," when there are primarily but three pairs of such organs; it seems to us that this portion is less clear and simple than the succeeding chapters. It has been pretty well shown by embryologists that there are four segments in the head of winged insects corresponding to the four pairs of jointed appendages, viz., the antennæ, mandibles, and first and second maxillæ. Where are we to look for more? This is the view which has been presented in this country, and which is based on the study of hexapodous insects of different orders; and it seems to us the figures of early embryos by Kowalevsky supports the view that there are four rather than five primary segments in the head; the eyes being developed upon the antennal segment, and the labrum and clypeus forming simply the front or facial wall of the œsophagus.

The work is claimed by the author to be an application of the "doctrine of descent" to the study of butterflies, and so it is when he considers the transformations and physical structure of these beautiful creatures, but why does he rather illogically, on p. 101, oppose the only apparent natural explanation of instinct, as the result of inherited habits? How can we conceive of the gradual development and evolution of the hundreds of species and genera from some primitive prototype, and not suppose that

the butterfly mind of to-day differs in some respects from the mental traits of primeval butterflies, which had a different environment, different food plants and different enemies, and which must have practiced different arts and stratagems in their struggles for life from those of their descendants?

NEWTON AND JENNEY'S GEOLOGY OF THE BLACK HILLS OF DAKOTA.[1]—This posthumous volume is a worthy monument to the memory of Mr. Newton, a young and promising geologist, who died before completing the main portion of the report, including the first three chapters. Chapter IV on the mineral resources, and V on the climate and resources, are by Mr. Jenney; these were, by resolution of the U. S. Senate, called for in advance of the final report, and with a preliminary map were published in the spring of 1876; the field work occupying the four summer and early autumn months of 1875. It will be remembered that Gen. Custer's famous reconnoisance was made in the summer of 1874.

The Black Hills were first geologically explored by Dr. F. V. Hayden, who made a rapid examination of the geology of the foothills and extremities of the region during the exploration of Lieut. (now Gen.) G. K. Warren, in 1857. Dr. Hayden remarked as the result of his observations, that the Black Hills of Dakota would form one of the most interesting studies on this continent, and that in all the western country he had never seen the Cretaceous, Jurassic, Triassic or red-bed, the Carboniferous and Potsdam rocks so well exposed for study as around the Black Hills, and he spoke of the desirability of a careful detailed topographical and geological survey of this range. The gold discovered under Custer, led the Government to order a geological survey of this region, and the results are placed before the people in this elaborate and valuable report.

Mr. Newton thus speaks of this isolated group of mountains: "Elevated as they are like an island above the surrounding sea of the plains, and separated by more than one hundred miles from the nearest spur or sub-range of the Rocky mountains, the Black Hills are a complete study in themselves. Exhibiting in the strata exposed, and in the general character of the elevation, most of the principal features of the geology of the Rocky mountains, they are a geological epitome of the neighboring portions of that great range. The geologist, therefore, finds in this region a monographic study of universal interest, and by the regularity of the uplift, by the absence of great faults in the strata, and by the splendid exposures of the sedimentary rocks, he is given a piece of mountain geology of great beauty, simplicity and ease of elucidation.

"Usually in explorations in the West or elsewhere, the field of

[1] *Department of the Interior. U. S. Geographical and Geological Survey of the Rocky Mountain Region.* J. W. POWELL in charge. Report on the Geology and Resources of the Black Hills of Dakota, with atlas. By HENRY NEWTON, E.M., and WALTER P. JENNEY, E.M. Washington, 1880. 4to, pp. 566.

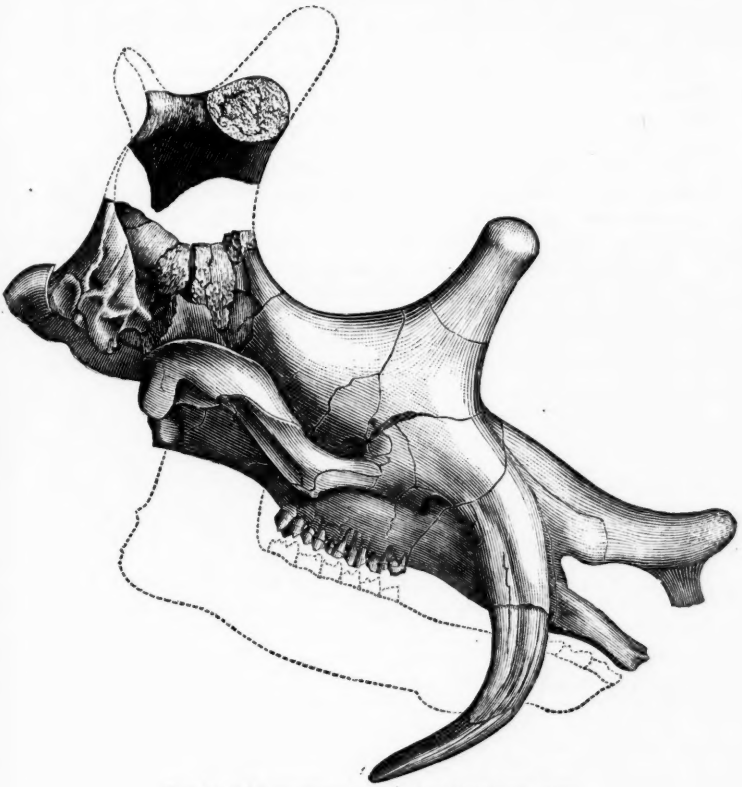
work of the geologist at any one time or season is but a part, and commonly a very small part, of a great system that extends over vast areas of country. Thus, in explorations in the Rocky mountains, the most assiduous labor of the geologist can cover thoroughly, in one season, but a small part of the great range, and his discussion of results cannot be complete in itself, but must depend largely upon work in the adjoining regions. Rarely then, does the geologist find his work so admirably circumscribed by nature as did those to whom the exploration of the Black Hills was committed. * * * Generally and simply the geological structure of the Black Hills is as follows: Around a nucleal area of metamorphic slates and chists, containing masses of granite, the various members of the sedimentary series of rocks, the Potsdam, Carboniferous, Trias or red-beds, Jura, Cretaceous and Tertiary, lie in rudely concentric belts or zones of varying width, dipping on all sides away from the elevatory axis or region of the Hills. From the Hills outward the inclination of the beds gradually diminishes until all evidence of the elevation is lost in the usual rolling configuration of the plains. At numerous points, also, within the area of the Hills, are centers of volcanic eruption of an age probably coincident with that of the elevation of the mountains themselves."

The chapters by Mr. Newton, who died of typhoid fever at Deadwood, in 1877, were revised and prepared for the press by Mr. G. K. Gilbert, while the report is preceded by an appreciative biographical sketch prepared by Professor J. S. Newberry.

The palæontology of the report, accompanied by sixteen elaborate plates of fossils, is by Mr. R. P. Whitfield; an essay on the microscopic petrography of the Black Hills, with two fine colored plates, is by John H. Caswell; while Professor Asa Gray offers a brief enumeration of the plants, and Mr. Horace P. Tuttle reports upon the astronomy and barometric hypsometry of the Black Hills.

A MEMOIR ON THE LOXOLOPHODON AND UINTATHERIUM, by Henry F. Osborn, Sc.D.[1]—This fine memoir opens auspiciously the quarto series of Contributions from the E. M. Museum of Geology and Archæology of the College of New Jersey. The fine series of specimens of *Dinocerata* obtained by the Princeton Scientific Exploring Expedition are here described and partly figured. A third species of *Loxolophodon* is described under the name of *L. speirianum*, which, judging from the figures given, was not less extraordinary than the other species of the genus. A good deal of light is thrown on the structure of these animals, especially as to the characters of the lower jaw. A note from Professor Guyot introduces the publication series, and a sketch of the Bridger beds of the Washakie basin closes the book.

[1] *A Memoir upon Loxolophodon and Uintatherium.* By HENRY F. OSBORN, Sc.D. Accompanied by a Stratigraphical Report on the Bridger beds in the Washakie basin. By JOHN BACH MCMASTER, C.E. 4to, pp. 54, IV plates, II maps. Published by the Museum, Princeton, 1881.



Loxolophodon cornutus Cope. One-eighth nat. size.

Loxolophodon cornutus Cope; from below. One-eighth nat. size.

HERVEY'S SEA MOSSES.[1]—In the September NATURALIST we had the pleasure of calling attention to the publication of a much needed help to the student of sea-weeds in Dr. Farlow's "Marine Algæ of New England and the Adjacent Coast." It is gratifying to be able now to add another book to the list of those devoted to the beautiful inhabitants of the sea, the "sea-mosses," as they are popularly called. The Rev. A. B. Hervey, long a student and admirer of these plants, has just brought out his "Sea Mosses," in which he has attempted to make "a book which should be a real and helpful guide to those who, though not expert botanists, and not having or using any aids to a good pair of eyes other than a simple pocket magnifier, desire to begin the collection and study of marine plants." The book is thus, to a great extent, designed for amateurs, and for those who, spending a few weeks at the sea-side, want to know somewhat about the pretty plants which are washed up by the waves.

The introductory chapter includes somewhat about scientific names, classification, geographical distribution, times and places for collecting, mounting and preserving, methods of study, clubs and classes, and an historical sketch. This chapter alone is well worth the price of the book to the sea-side visitor, that portion treating of mounting and preserving being especially well treated. A chapter each is given to the Bright green Algæ, the Olive-colored Algæ and the Red Algæ. The general order followed is that "adopted by Dr. Farlow from Professor Thuret, in his list of North American Algæ." Keys are given which readily lead the student to the genera. The species are described in simple language, and many little interesting items are thrown in which add much to the value of the book. Twenty colored plates, most of which are very good, representing twenty-four species, are bound into the book. These are engraved from photographs of specimens in the author's herbarium, so that they represent real plants. A short glossary and an index of genera and species close this pretty book, which is tastefully gotten up by both printer and binder. We trust that both author and publisher will be amply repaid for their venture in trying to give to Americans a popular book on a scientific subject.—*C. E. B.*

BAILEY'S HANDBOOK.[2]—This neat little book will prove a most useful one to many students and teachers of botany. The author was fortunate in securing the aid, in particular subjects, of such men as Professor C. H. Peck, who contributed the article on Fungi, Charles Wright on Cactaceæ, Professors D. C. Eaton, W. H. Brewer, Edw. Tuckerman, and others. A chapter is given to

[1] *Sea Mosses;* a Collector's Guide, and an Introduction to the study of Marine Algæ. By A. B. HERVEY, A.M. S. E. Cassino, Boston, 1881.

[2] *The Botanical Collector's Handbook.* By W. WHITMAN BAILEY, B.P., Olney Professor of Natural History (Botany) in Brown University. Naturalists' Handy Series. Geo. A. Bates, Salem, Mass., 1881.

such topics as the collector's outfit, the vasculum, portfolio, map, lens, trowel, note-book and pocket-knife. The instructions are clearly given in an attractive manner. In the second chapter, under Fieldwork, and How to use the Portfolio, very many excellent hints are given. The section on Cactaceæ is especially valuable. Mosses (from notes by T. P. James), Lichens and Algæ are treated of in the succeeding sections. Professor Peck's section on collecting and pressing Fungi occupies fourteen pages, and it need scarcely be said that it is one of the most valuable in the book. Chapter III is devoted to closet work, including pressing and poisoning. In Chapter IV, the herbarium, labels, cases, economic collections and botanic gardens receive due attention. An excellent list of general systematic works, special floras (North American), floras of other countries, general works and botanical journals is given. The final chapter on public herbaria describes briefly a few of the herbaria of this country.—*C. E. B.*

Book of the Black Bass, by Dr. J. A. Henshall.[1]—This volume gives a full account of the appearance and habits of the two species of *Micropterus* which inhabit the fresh waters of the United States, together with directions to the angler, and many notes of interest to the sportsman. The book is well illustrated, and is, to our thinking, the most agreeably written fisherman's book yet produced in this country. We recognize in the author a sportsman of the best type, as well as a naturalist who has studied his subject *con amore*. We make two criticisms on two points for which the author is not responsible. The so-called family of "*Centrarchidæ*" is not yet distinguished from the *Percidæ*, and is not worthy of adoption. The specific name "Dolomieu," given to one of the species by Lacepéde, appears to us not usable in that form. It is, indeed, not now usable at all, for it was a popular French equivalent for a scientific specific name, which Lacepéde in fact never gave. This was not an uncommon custom with the older French naturalists, and generally their popular names have been translated into classic specific names, and thus partly preserved. It is, however, entirely optional with later naturalists whether they do this or not, and as in this case it was not done until several other good names had been given, there is no necessity for adopting this inelegant sobriquet.

North American Mesozoic and Cænozoic Geology and Palæontology, by S. A. Miller.[2]—This is an octavo volume of 338 pages, which contains, in Mr. Miller's language, "an abridged

[1] *Book of the Black Bass.* Comprising its complete Scientific and Life History, together with a practical treatise on Angling and Fly-fishing, and a full description of Tools, Tackle and Implements. By James A. Henshall, M.D. 8vo, pp. 464, 11 plates, cuts. Bound. Published by Robert Clark & Co. Cincinnati, 1881.

[2] *North American Mesozoic and Cænozoic Geology and Palæontology.* By S. A. Miller. Published by the Cincinnati Society of Natural History. 8vo, pp. 338. (October, 1879.) Cincinnati, 1881.

history of our knowledge of the Triassic, Jurassic, Cretaceous and Tertiary formations of this continent." This description consists in part of extracts compiled from the writings of American geologists, and in part of the author's own observations. It forms a valuable synopsis of the subject, and the references to the palæontology will be especially welcome, since it is the only compilation of this work in existence. Such a work deserves especial commendation, since American naturalists are generally precluded from taking it up owing to the pressure of new work. It is to be hoped that Mr. Miller will be able to accomplish for the extinct vertebrates what he has already done for the invertebrates, in his synopsis of the described genera and species. Mr. Miller's views as to the glacial period are very pronounced. He does not find any evidence of the existence of such a period in North America, either in the stratigraphy or the fossils.

ON THE STRUCTURE AND DEVELOPMENT OF THE SKULL IN THE BATRACHIA, Part III, by Wm. Kitchen Parker, F.R.S.[1]—This is the latest of Professor Parker's memoirs, which form a series of much value. The study of the morphology of the vertebrate skull has always possessed a high interest, and Professor Parker's contributions have added much to our knowledge of it. The present part refers to the *Anura*, and includes descriptions of numerous species and genera. Of the anatomical work we can speak in terms of high praise. Unfortunately Professor Parker has not been able to learn, from his researches, the true relations of the contents of the order of *Anura*. This is seen in his adherence to the system of Günther, which is, in every respect, worthless; and in his entire ignorance of the work of American naturalists on the subject. In this country the osteology of the *Anura* was understood sixteen years ago, and the classification was then placed upon a positive foundation. Professor Parker's knowledge of the literature is evidently not what it should be. The memoir is illustrated by forty-four beautifully executed plates.

RECENT BOOKS AND PAMPHLETS.—Notes on the Vertebrata of the Preglacial Forest Bed Series of the East of England. Part IV. Rodentia and Insectivora. By E. T. Newton, F.R.S.

Notes on the Vertebrata of the Pre-glacial Forest Bed Series of East of England. Part V. Proboscidæ and Cretacea. By E. T. Newton, F.R.S. 8vo, pp. 8. From the Geological Magazine, June and July, 1881. London, 1881. From the author.

Proceedings of the United States National Museum. 8vo, pp. 34. Washington, 1881.

Proceedings of the Academy of Sciences, Philadelphia, July 1881. pp. 15. Philadelphia, 1881.

Proceedings of the American Association for the Advancement of Science, Twenty-ninth Meeting, held in Boston, Mass., Aug., 1880. 8vo, pp. 800, plates, cuts. Published by the society, Salem., 1881. From the society.

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[1] *On the Structure and Development of the Skull in the Batrachia.* By WILLIAM KITCHEN PARKER, F.R.S. Part III. 4to, pp. 266, 44 plates. From the Philosophical Transactions of the Royal Society. Published by the Society. London, 1881.

Further notes on the Pollination of Yucca and on Pronuba and Prodoxus. By C. V. Riley. 8vo, pp. 34, cuts. From the Proceedings of the American Association for the Advancement of Science, Aug, 1880. 1881. From the author.

Transformations of Planorbis at Stemheim, with remarks on the effects of gravity upon the forms of shells and animals. By Alpheus Hyatt. 8vo, pp. 28, 2 plates, cuts. Abstract from the Proceedings of the American Association for the Advancement of Science, August, 1881. Boston, 1881. From the author.

On the Origin of the Iron Ores of the Marquette District of Lake Superior. By M. E. Wadsworth. From the Proceedings of the Boston Society of Natural History. 8vo, pp. 12. Boston, 1881. From the author.

The Glacial Phenomena of North America and their relation to the question of Man's Antiquity in the Valley of the Delaware. By Rev. Frederick G. Wright. 8vo, pp. 8. Philadelphia, 1881. From the author.

Census Bulletin No. 223. Preliminary Report on the Production of Anthracite Coal. By Raphael Pampelly, Director. pp. 6.

Census Bulletin No. 245. Preliminary Report upon the Salt Manufactures of the United States. By W. L. Rowland, Special Agent for Chemical Industry. pp 2.

Census Bulletin No. 246. Statement of Indebtedness and analysis of the outstanding Bonded Debt of the Cities and Towns of the United States containing a population of 7500 and upwards. By Robert P. Porter, Special Agent on Wealth, Debt and Taxation. pp. 10.

Census Bulletin No. 251. Cotton Produce. By Eug. W. Hilgard, Special Agent in charge of Cotton Production. pp. 6.

Census Bulletin No. 261. Statistics of the Fisheries of the Great Lakes. By G. Browne Goode, Special Agent in charge of Fisheries Division, pp. 8. Department of the Interior, Census Office, Washington. Government Printing Office, Washington, D. C., 1881. From the Sec. Interior.

Om de formentleige Levinger af en Kæmpemæssig, med Cariama, beslætet, uddod Fugl fra Brasiliens Knoglehuler. Af. J. Reinhardt. 8vo, pp. 13. (Aftryk af Vidensk. Medd. fra den Naturh. Foren. 1, Kjobenhavn, 1881. From the author.

Vogle Bewærkniger om Gumlesnes, især Bæltedyrenes, Bækken. Af. J. Reinhardt. 8vo, pp. 11, 1 plate. Aftryk af Vidensk. meddl. fra den Natur. Foren, 1, Kjobenhavn, 1881. From the author.

Notes on the habits of the Manatees (Manatus australis) in captivity in the Brighton Aquarium. By Agnes Crane. 8vo, pp. 6, cut. From the Proceedings of the Zoological Society of London. London, 1881. From the authoress.

Public Gardens and Plantations. Hints and suggestions for raising Cinchona plants from the seed and establishing Cinchona plantations. By D. Morris, Director of Public Gardens and Plantations. 4to, pp. 4. Kingston, Jamaica, 1881. From the director.

Cinchona Cultivation in Jamaica. 4to, pp. 2. (Kingston) Jamaica, 1881. From the Botanical Department.

La Emulacion Periodico de la Sociedad Medico-Farmaceutica. Redactor en Jeff Jaun Dondé. Tomo IV, numeros 475. Administrador, J. R. Sauri. Merida, Yucatan, 1881. From the administrator.

Primitive Industry; or Illustrations of the handiwork in Stone, Bone and Clay of the Native Races of the Northern Atlantic seaboard of America. By Charles C. Abbott, M.D. Roy. 8vo, pp. 560, cuts, bound. Salem, Mass., 1881. From the author.

Horses' Teeth; a treatise on their mode of development, physiological relations, anatomy, microscopical character, pathology and dentistry; based on the well-known odontologists and veterinary surgeons; to which is added a vocabulary of the medical and technical words used. By William H. Clark. 12mo, pp. 262, cuts, bound. New York, 1881. From the author.

Bacteria; the smallest of living organisms. By Dr. Ferdinand Cohn. Translated by Charles S. Dalley. 8vo, pp. 30, 1 plate. Rochester, N. Y., 1881. From the translator.

The Journal of the Cincinnati Society of Natural History, Vol. IV, No. 3, Oct., 1881. 8vo, pp. 80, 1 plate, cuts. Cincinnati, 1881. From the society.

Tenth Report of the State Entomologist on the Noxious and Beneficial Insects of the State of Illinois. By Cyrus Thomas, Ph.D., State Entomologist. 8vo, pp. 232, cuts. Springfield, 1881. From the author.

Notes upon the genus Catocala, with descriptions of new varieties and species. By Henry Edwards. 8vo, pp. 8. From the Bulletin of the Brooklyn Entomological Society, November, 1880. Brooklyn, 1880. From the author.

Palæontological Bulletin, No. 33. On some Mammalia of the Lowest Eocene beds of New Mexico. By E. D. Cope. 8vo, pp. 12. Ext. Am. Phil. Soc. Philadelphia, Sept. 17, 1881. From the author.

The Century Plant. By Joseph F. James. 8vo, pp. 2. Ext. from the Journal of the Cincinnati Society of Natural History. Cincinnati, 1881. From the author.

Fourteenth Annual Report of the Trustees of the Peabody Museum of American Archæology and Ethnology, Vol. III, No. 1. 8vo, pp. 42. Cambridge, 1881. From the curator.

Geology of Washtenaw county, Michigan. By Alexander Winchell. 8vo, pp. 30. Ext. from the History of Washtenaw county. Chicago, 1881. From the author.

Climate of Michigan. By Alexander Winchell. 8vo, pp. 12. From the Annual Report of the Horticultural Society, 1880. Chicago, 1881. From the author.

Proceedings of the United States National Museum, August, 30, 1881. 8vo, pp. 30. Washington, 1881. From the society.

The nature of the existence of Matter. By Edward Randall Knowles. pp. 8. Pascoag, R. I., 1881.

Studies in Astronomy. A lecture elaborated for general readers. By Arthur K. Bartlett. 12mo, pp. 56. Battle Creek, Mich., 1881. From the author.

Bulletin of the Essex Institute, Vol. XIII, Nos. 4, 5, 6—April, May, June, 1881. 8vo, pp. 76. Salem, 1881. From the society.

Circulars of Information of the Bureau of Education, No. 6, 1881. A Report on the teachings of Chemistry and Physics in the United States. By Frank Wigglesworth Clark, S.B. 8vo, pp. 220. Government Printing Office, Washington, 1881. From the Sec. of Interior.

Charter and By-Laws of the Texas Copper Mining and Manufacturing Company. A History of the Company. A Letter from the Department of the Interior. By Joseph S. Wilson, Commissioner. Professor Wm. DeRyees' Geological Report. 8vo, pp. 16. Dallas, Texas, 1880. From the company.

Mining World, Sept. 15, 1881, Vol. II, No. 2. 4to, pp. 16. Los Vegas, N. M.

Report to his Excellency, the Governor. The Thirty-ninth Missouri University Catalogue, 1880–81. 8vo, pp. 172, 5 plates. Jefferson City, 1881. From the university.

Report on the Geology and Resources of the Black Hills of Dakota, with Atlas. By H. Newton, M.E., and Walter Jenney, M.E. Department of the Interior, Washington, U. S. Geog. and Geol. Survey of the Rocky Mountain region, J. W. Powell in charge. 4to, pp. 564, 1880.

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GENERAL NOTES.

BOTANY.[1]

An Interesting Lady's Slipper.—Professor Bastin, of the University of Chicago, describes and figures, in a recent number of *The Druggist*, a two-flowered specimen of the large Lady's Slipper *(Cypripedium spectabile)*, which he found while botanizing last June in the region at the southern end of Lake Michigan.

[1] Edited by Prof. C. E. Bessey, Ames, Iowa.

One flower was of the normal form, but the other was almost perfectly regular. "It had all three sepals distinct, and of equal size; it had no 'slipper' or lip, but the three nearly equal petals were shaped alike, differing from the sepals only in being a little narrower, and, of course, alternating with them. The ovary, which in most Orchidaceæ, and all other Cypripediums, is twisted through half a revolution, in this case was not twisted at all, and it was only slightly, instead of conspicuously bent to one side, so that the flower faced more nearly upward than in the ordinary form. The column, as usual, consisted of united stamens and pistils, but it was much less bent to one side, and the union of parts was not nearly so complete. There were three distinct anthers instead of two, alternating with the lobes of the distinctly three-lobed stigma. Instead of one large, dilated, triangular, fleshy body, apparently occupying the place of the third stamen in the ordinary form, and heretofore supposed in fact to be homologous with the third stamen, there were two of these bodies alternating with the petals, and evidently belonging to a distinct whorl. They may really be the homologues of stamens, but if so, the plan of the flower contemplates two distinct sets of stamens, with three in each set. Or we may, perhaps, with better reason, regard them as petals belonging to an inner whorl that alternates with the first."

THE CONIFERS OF JAPAN.—Dr. Maxwell T. Masters publishes in the *Journal of the Linnean Society* for July, a valuable paper on the Conifers of Japan. Thirteen genera are represented, and of these one, *Sciadopitys*, is peculiar to Japan; two, viz: *Cryptomeria* and *Cephalotaxus* are peculiar to Japan and China. *Ginkgo* is supposed not to be a native of Japan, although often cultivated. Of the forty-one species enumerated, no less than twenty-two (which are indicated by an asterisk in the subjoined list) are peculiar to Japan, and this fact leads Dr. Masters to infer "that Japan may have formed a special center whence Conifers have migrated elsewhere." The species given, omitting varieties, are the following: **Thuja dolabrata* L., **T. Japonica* Maxim., *T. orientalis* L. (*Biota orientalis* Endl., the Chinese arbor vitæ of the gardens), **T. pisifera* Masters (*Retinospora pisifera* Seib. et Zucc.), **T. obtusa* Masters (*Retinospora obtusa* Seib. et Zucc.), *Juniperus rigida* Seib. et Zucc., **J. nipponica* Maxim., *J. littoralis* Maxim., *J. taxifolia* Hook. et Arn., *J. chinensis* L., *Cryptomeria japonica* Don., **Cephalotaxus pedunculata* Seib. et Zucc., *C. drupacea* Seib. et Zucc., *C. umbraculifera* Seib., **Taxus cuspidata* Seib. et Zucc., **T. tardiva* Laws., **Torreya nucifera* Seib. et Zucc., **Podocarpus Nageia* R. Br., **P. cæsia* Maxim., **P. appressa* Maxim., *P. macrophylla* Don., **Sciadopitys verticillata* Seib. et Zucc., *Pinus densiflora* Seib. et. Zucc., *P. Thunbergii* Parl., *P. parviflora* Seib. et Zucc., *P. koraiensis* Seib. et Zucc., *P. cembra* L., var. *pumila* Parl., *Picea Maxmowiczii* Regel, **P. polita* Carr., **P. Alcockiana* Carr., *P.*

ajanensis Fischer, *P. Glehnii* Fr. Schmidt, **Tsuga Sieboldi* Carr., **T. diversifolia* Masters, *Abies firma* Seib. et Zucc. (includes also the forms hitherto known as *A. bifida* Seib. et Zucc.), **A. brachyphylla* Maxim., *A. Veitchii* Lind., *A. Sachaliensis* Masters, **A. homolepis* Seib. et Zucc., **A. Mariesii* Masters, **Larix leptolepis* Endl. The value of this paper is greatly enhanced by numerous excellent figures, and by what appears to be a full list of the numerous synonyms under which these plants have been known. It cannot fail to receive attention from the growers of Japanese Conifers in this country, and it is to be hoped that it will serve to better the nomenclature of these trees in the gardens and catalogues of our nurserymen, to say nothing of its use among botanists themselves.

A POCKET MANUAL OF BOTANY WANTED.—Why has not some enterprising book-publishing house given the army of collecting botanists in this country a neat little pocket manual of botany? Every one who has ever collected at all (and what botanist has not?) has felt the need of carrying a manual with him to enable him to call to mind certain peculiarities which require examination in the field; but the burden of carrying a rather large and somewhat heavy book on a long jaunt, is often too much in addition to the load of plants, so the book remains behind. If we had a little pocket edition of, we will say for example, Gray's Manual, printed on thin paper, in small type (agate or pearl), bound in flexible covers and trimmed close to the margins, there is no reason why every student and collecter might not always have with him this much valued guide. A collector needs to have his manual with him in the field, just as much as the engineer needs his "field book," and the style of the well-known Henck's Field-Book might profitably be taken as a model by our book makers.

LEMNA POLYRRHIZA AGAIN DISCOVERED IN FLOWER ON THE DETROIT RIVER.—On July 24, 1881, after an interval of ten years, I have again found *Lemna polyrrhiza* L., in flower, in great abundance, in the same pond on Belle Isle, in the Detroit river, Michigan, in which my first discovery (of July 30, 1871) was made, my specimens at that time determining the fact, which had been disputed, that the flower contained two ovules. (See AMERICAN NATURALIST, Vol. 5, p. 652.) The flowers were in every stage of development, some being in bud (the stamens still enclosed in the spathe), some in full blossom, while others were past or gone to seed. The shade of overhanging growths, such as wild rice, pickerel weed, blue flag and Sagittaria, seemed to favor the production of the flowers, they being found more abundant when thus situated, the frond, as I have observed, being at the same time reduced in size. As might be expected, in clusters representing fronds of various stages of growth, the older fronds were the flowering ones.

At 4 h. 15 m. P. M. both stamens were expanded; but closed at night, when I placed them in a vessel of water. At 7 o'clock next morning they had commenced to expand, three sets of flowers being in that condition. At 7 h. 45 m. A. M. eighteen had expanded, while by 8 h. 30 m. over thirty sets of flowers had opened, remaining so all day. They invariably closed towards night. In each instance one of the two stamens was always in advance of the other in ripening its pollen.

Kept in water, for two weeks they continued to blossom, though gradually going to seed. At the end of that time no more flowers were produced, though the plants were not taken from the water for drying till August 17th, or about three and a half weeks altogether. The young plants were produced prolifcrously in large numbers, falling to the bottom of the vessel.

In 1871, at the west end of this pond, I found *L. polyrrhiza*, *L. trisulca* and *L. minor* in flower at the same time, the first named being largely in the majority. While at the other end of the pond *L. trisulca* was found in blossom, associated with flowerless *L. polyrrhiza* and *L. minor*, the latter two being greatly in the minority. At the present time *L. minor* has totally disappeared, and there are only a few stray depauperate specimens of *L. trisulca* to be seen, *L. polyrrhiza* being evidently the victor, having driven out the other species and taken possession of the pond, which, this year, owing to excessively dry weather, is greatly reduced in size.—*Henry Gillman, Detroit, Michigan.*

Botanical Notes.—Charles S. Dolley, student in the medical department of the University of Pennsylvania, has rendered an excellent service in translating Cohn's brochure on Bacteria. The translation is well done, although the German idiom is often retained, sometimes a little awkwardly. A good plate, borrowed from the *Microscopical Journal*, is added, and some foot-notes are appended. The opening sentence of the translator's preface furnishes the reason for this attempt: "Why scientific and medical books, above all others, should not be published in cheap editions in this country, as they are abroad, is a query that has occurred to me at various times since the beginning of my medical studies." It is to be hoped that this translation will be followed by others from the same hand in the near future.——The August and September numbers of the *Torrey Bulletin* are unusually rich in important papers. We note the following in the August number. "Notes on Gymnosporangia," by Dr. Farlow; "Fern Notes," by G. E. Davenport, describing *Tænitis lanceolata* R. Br., discovered this year on Old Rhodes Key, Fla., by A. H. Curtiss; "New Species of North American Fungi," by J. B. Ellis, describing *Valsa tuberculosa*, *Lephiostomà tingens*, *Sphæria funicola*, *S. latebrosa*, *S. gallophila S. defodiens*, *S. Mertensiæ*, *S. leiostega*, *S. Eckfeldtii*, *Meliola maculosa*, *Asterina nigerrima*. In the September number E. L. Greene, in "New species of plants, chiefly

New Mexican," describes *Astragalus Gilensis*, *A. mogollonicus*, *Potentilla subviscosa*, *Megarrhiza Gilensis*, *Senecio cardamine*, *S. Howellii* and *Polygonum Parryi*; Professor Eaton continues his valuable notes "New or little known Ferns of the United States," and describes a fern from Florida (discovered by A. H. Curtiss), *Aspidium trifoliatum* Swartz, not hitherto known in the United States; G. E. Davenport's note on "Vernation in Botrychia," is interesting as recording the case of "two Botrychiums whose buds have thrown a doubt, for the first time in my experience, on the reliability of the bud-form as a test for the determination of the smaller species of the genus;" W. H. Leggett describes the curious bellows-like structure of the anthers of *Rhexia Virginica*, by means of which the pollen is actually blown out upon the body of a visiting insect!——The September *Gardener's Monthly* contains an interesting account, by Thomas Meehan, of the snow plant *(Sarcodes sanguinea)* of the Sierras. As a result of many examinations it is determined to be "an annual, germinating on small pine roots, and subsequently obtaining subsistence from the earth, as *Aphyllon* and *Epiphegus* do.". In the same number Mr. Meehan records the receipt of specimens of horseradish seeds, which are very rarely seen; these came from Maine.——A new tree fern, *Cyathea monstrabilia*, from Jamaica, is described by G. S. Jenman, in the September *Journal of Botany*. The trunk is four or more feet in height, and three inches in diameter.——C. M. Vorce, in the *Am. Mo. Microscopical Journal*, describes, rather vaguely, the wholesale destruction of acari by some fungus, which may have been some species of *Entomophthora*.——Holt & Co., N. Y., have just brought out an American edition of McNab's Botany, revised by C. E. Bessey. As issued, it includes within one compact 16mo volume, the morphology and physiology, and the outlines of classification which composed the two books of the English edition. In introducing it to American students in second or middle class schools, the editor hopes "that it may serve to direct attention to the study of plants as living things, rather than to their bare analysis and classification."——Geo. A. Bates, of Salem, Mass., offers for sale bound copies of Dr. Farlow's new book, "The Marine Algæ of New England and the Adjacent Coast."——Joseph F. James' short paper on "The Century Plant," read before the Cincinnati Society of Nat. History, contains a number of interesting facts about this valuable plant. ——E. Lamson Scribner, of Girard College, Philadelphia, has undertaken to publish sets of the grasses of North America in fascicles of about one hundred species each. Specimens in quantity are solicited from all parts of the country, especially from the far South and South-west. Those donating specimens for this work will receive sets, more or less complete, according to the quantity and value of their contributions. The first fascicle is promised for January next. It is sincerely to be hoped that Mr.

Scribner will receive such encouragement as will enable him to carry to a successful conclusion a work of so much importance. ——Dr. N. L. Britton has compiled for the Geological Survey a "Preliminary Catalogue of the Flora of New Jersey." It is printed on alternate pages, the blank pages being intended for notes, additions and corrections. J. B. Ellis furnished the list of Fungi, A. B. Hervey the marine Algæ, and Francis Wolle, the fresh-water Algæ, and T. F. Allen the Characeæ. The notes are valuable, and in many cases are quite full. Copies (to be returned in 1882) may be obtained by addressing the State geologist, Professor Geo. H. Cook, New Brunswick, N. J.

ZOÖLOGY.

The Resemblances and Diferences of the two Sexes, by M. G. Delaunay.—This is the title of a paper published in the *Revue Scientifique* for September 3, 1881. It has special interest as presenting the most complete review of the differential characters of the sexes of the human species which has appeared. The author's conclusions are curious and instructive. We give a necessarily much abbreviated synopsis.

The author commences by showing that the female is much the larger and more powerful in most of the lower animals. He cites the Cephalopoda, certain cirripeds, most annelids, most insects—as Hymenoptera and Lepidoptera. Among vertebrates the female is the larger among many fishes and reptiles. Among the higher *Vertebrata*, the relations are reversed. In birds, except in a few birds of prey, the male is the larger, and this is universally the case among *Mammalia*. This superiority of the male sex consists in the following points: In the male the phenomena of nutrition are the more intense. The blood is denser and redder, and contains more red corpuscles and hæmoglobine, and fewer white corpuscles and less water. Malassez has proven that man has a million more red corpuscles in a cubic millemeter of blood than woman. Man eats more than woman. The public charities know that it costs more to feed a boy than a girl. Nevertheless though she eats less, woman eats more frequently. In the asylums the women take food from the table, thus doubling the number of their meals.

Respiration is more intense in man than in woman. In a man and woman of equal size, the man has a demilitre more pulmonary capacity.

Man absorbs more oxygen, though he breathes less frequently. According to Quetelet, between the ages of fifteen and fifty, woman has one inspiration per minute more than man. At all ages man excretes more carbonic acid than woman. The temperature of man is more elevated than that of woman. In the circulation, the blood-pressure is stronger in man than in woman, but the pulse is less frequent. The differences in several animals are as

follows: in the lion 18 pulsations per minute; the ox, 10; the sheep, 12; and 10–14 in man. The anatomical preëminence of the male is especially in the functions of animal life.

The skeleton of woman is lighter in proportion to her total weight than that of man. It has been discovered that the male skeleton contains more inorganic matter than that of woman, and more carbonate of lime and less phosphate of lime. The woman uses the right side less than the man. According to Livon the left shoulder blade is larger than the right in woman, as in the inferior races. Broca found that the length of the clavicle as compared with the humerus is greater in woman than in man, as it is greater in the negro than in the white race. Man as is well known, is larger than woman, and also more heavily built, although the adipose coat of woman frequently gives an opposite impression to the observer. Among the Indo-European nations, woman is more prognathous than man.

The difference between the voices of man and women are perceptible among many of the higher animals. The inferiority in muscular energy on the part of women amounts to one-third the force exerted by the male. Muscular movements are more precise in man; this is seen in pianists, the best of whom are men.

The skull is more voluminous in the male. Wiesbach found its cubic contents in German women and men to be as 878 to 1000. Morselli compares the capacities as 85 to 100. According to Broca the difference in favor of man is 150 centimeters for the French and 211 for the Parisians. In woman the skull is generally more elongate and less elevated.

The brain of man is heavier than that of woman, not only absolutely but relatively. The size of woman to that of man being as 927 to 1000, the weight of her brain is to that of man as 909 to 1000. When of equal size, the brain of woman is much less heavy than that of man. The mean weight of seventeen male brains exceed that of as many brains of females of the same size, by 172 grammes. There are also differences of conformation. According to all anthropologists (Broca, Wagner, Huschke), the frontal lobes are less developed in woman. Huschke found fifty-four cubic centimeters difference in favor of man. On the other hand, the occipital lobes are more voluminous in woman than in man. According to Wagner, the female brain is always in a more or less embryonic condition. Some anatomists think that the right brain is more developed in woman and the left in man. This will explain why, in passing, man generally chooses the right hand, and woman the left.

After a discussion of the metaphysical qualities of the sexes, the author presents a view of their peculiarities in different races. His conclusions are as follows:

"The preëminence of the female sex, only seen in certain infe-

rior races of men, and in the infants of the higher races, marks an inferior stage of evolution.

"It is the same with the equality of the sexes, which is only seen in little developed individuals, as inferior races and species, young persons, the aged, and in inferior classes of society.

"On the contrary, the preëminence of the male over the female represents a superior phase of evolution, since it characterizes superior species and races, adult age and the superior classes of society.

"From the moral as from the physical side, evolution appears to have progressed from a state of superiority of the female to that of the male sex; and the stage of equality represents an intermediate stage."

On the Morphology of the Corbula of certain Plumularidæ.—The specialized portion of the stem of the Plumularidæ which bears the sexual organs and which, from its likeness to a basket, is known as the corbula, has been compared by the greatest authority on the hydroids, Professor Allman, to a metamorphosed pinna, while the ribs of the same have been likened to the changed mesial nematophores of the pinna. Although this comparison has much to recommend it in *Aglaophenia spinosa* All., and some others, it is certainly not the homology of the corbula in all genera, as I have shown in my report on the deep sea hydroids of the *Blake* (Bull. Mus. Comp. Zool., Vol. VIII, No. 7). The true morphology of the corbula in these new genera, and the facts which support it, may be stated briefly as follows:

In the new genus Pleurocarpa, collected off St. Vincent by Mr. Agassiz, we have a true corbula homologous with a hydroid *branch*, and not with a modified pinna. In it the so-called corbula ribs are modified pinnæ and not comparable with metamorphosed nematophores. Showing that such is the case, we find in this genus that the proximal end of a branch which bears the corbula assumes the normal form of a corbula, while the distal extremity retains the true character of a branch with pinnæ unchanged. This genus seems to me to indicate, without doubt, that the corbula is a modified branch, bearing as ribs metamorphosed pinnæ instead of being, as taught by Allman, the homologue of a pinna with developed nematophores forming corbula ribs.

When now we come to study another genus of Plumularidæ, in which the protection of the sexual organs also assumes the form of a corbulæ, we find verifications of the same morphology which has been shown to be true in Pleurocarpa. The distal ends of the branches in Hippurella are true corbulæ, while the proximal portions are normal branches and bear primæ regularly arranged, imparting to the whole an unquestionable likeness to a branch. Indeed, no one can for a moment question that here

these organs are metamorphosed branches, although some doubt may arise as to whether the distal ends are true corbulæ or not. If we compare Hippurella with Callicarpa Fewkes, all question as to the latter point is silenced, for in Callicarpa we have a structure which is undoubtedly a true corbula similar to that of Hippurella.

In Callicarpa we have a hydroid with simple stem, bearing pinnæ arranged regularly and alternately along its whole extent. On the main stem from which these pinnæ spring, there also arise corbulæ which closely resemble in shape spikes of wheat or barley. At that point on the main stem from which these arise there is no variation in the normal arrangement of the pinnæ, and no omission of a single pinna such as would be expected if the spikes were modified pinnæ. The corbulæ arise like any branch, and in their arrangement on the stem, no less than in their shape, bear every resemblance to metamorphosed branches.

The genus Callicarpa has still another interesting resemblance to Hippurella bearing on this homology. While the latter genus has the distal extremity of the branch modified into a corbula, and the proximal end remains normal with true pinnæ, Callicarpa has the whole branch changed in the same way, and it is destitute of those proximally placed pinnæ which characterize the corbula of Hippurella.

In conclusion, considering the corbula of the three genera, Pleurocarpa, Callicarpa and Hippurella, we are led to give to it a different homology from that which has been suggested for the same structure, as I believe, in some species of Agalophenia. The strongest evidence in support of my theory is found in Pleurocarpa, where the corbula is undoubtedly a modified branch. Are we to suppose that the corbula is not homologous in different genera, or that in one genus it is a modified pinna, while in another a metamorphosed branch?—*J. Walter Fewkes, Cambridge, September, 1881.*

Migration of Birds at Night.—The vexed questions regarding the migrations of birds and whether they fly by night and at great elevations have been elucidated by Mr. W. E. D. Scott, in the Bulletin of the Nuttall Ornithological Club for April. While, with some friends, looking through the 9½ inch equatorial at Princeton, N. J., at the moon, his attention was arrested by numbers of small birds, more or less plainly seen, passing across the field of observation. Most of the birds were the smaller land birds, among which were plainly recognized warblers, finches, woodpeckers, and blackbirds, the relative numbers being in the order of kinds given. Among the finches Mr. Scott identified *Chrysomitris tristis*, and the blackbird was the *Quiscalus purpureus*. With rare execeptions, the birds were seen to be flying from north-west to south-east. By observing the height of the moon

above the horizon in degrees and the two limits of the area of observation—that is, how near or how far the birds noted were from the glass—it was found, with the aid of Professor C. A. Young, that the birds flew at the great elevation of nearly 10,000 feet, and that the average number of birds passing through the field of observation per minute was four and a half. In commenting on these fact, Mr. J. A. Allen remarks that Mr. Scott's novel and important observations definitely establish several points in relation to the migration of birds that have heretofore rested almost wholly on conjecture and probability. "We have, first, the fact that the nearest birds seen through the telescope must have been at least one mile above the earth and may have ranged in elevation from one mile to four miles. It has been held that birds, when migrating, may fly at a sufficient height to be able to distinguish such prominent features of the landscape as coast-lines, the principal water-courses, and mountain-chains over a wide area. Of this, thanks to Mr. Scott, we now have proof. It, therefore, follows that during clear nights birds are not without guidance during their long migratory journeys, while the state of bewilderment they exhibit during dark nights and thick weather becomes explainable on the ground of their inability to discern their usual landmarks—points that have been assumed as probable, but heretofore not actually proven."

Braving the "Blizzards."—On the last day of March I visited the Iowa Agricultural College, at Ames, Story county. I walked over from the station and back, and while returning my path lay across a little knoll, from which the snow had disappeared, though it still covered half the country around. Near the top of this knoll a little bird flew up from the dry grass at my feet. Through a "survival" of the old habit of boyhood, of searching for the nest on the spot whence a bird rises in this way, I instinctively stopped and looked, and there, on the ground, was a neat little nest, in the bleached prairie grass, containing three small speckled eggs! Great patches of snow and ice lay in all the hollows near at hand, while a most terribly cold wind was blowing from the north! It was a dreary, bitter day, and March was really going out like a roaring lion! Really, it did not seem to me that the snow could have disappeared from the knoll more than three or four days before. Later still more snow fell, and to-day, as I write this item, I am "snow-bound" seventy miles west of my home! That little winter snow-bird (*Plectrophanes nivalis*, as I suppose) no doubt understands her business, but I should say she had set about rearing a family under circumstances of extreme difficulty! It would seem that the younglings must perish from the lack of insect food, if they escaped freezing to death—though in the adult state they live on the seeds of our prairie weeds. At all events I never found a bird's nest during a March "blizzard" before.—*Charles Aldrich, Webster City, Iowa, April 12, 1881.*

SNAKES CLIMBING TREES.—It seems to be in order, just now, for any person who has ever seen a snake "up a tree," to narrate the happening in some of the natural history papers. In 1863, while our regiment was stationed at Columbus, Ky., several of us made an excursion to the battle-field of Belmont, just over the river. While riding along through the woods, I heard a slight rustling just over my head. I was under a pawpaw tree, and looking up I was not a little surprised to see a small grass-green snake resting confidently upon the twigs and leaves not a foot from my face! The reptile was up seven or eight feet above the ground; but how it got there I had no means of knowing. Of course it "climbed" by some means. This tree was about six inches in diameter, and the bark was quite smooth. The timber, however, was very thick at this place, and the snake may have ascended some other tree better adapted to the purpose of a roadway. These little snakes were quite plenty in that portion of Dixie, and are often found in this vicinity. They are eighteen to twenty or twenty-four inches in length, grass-green on the back, and greenish-white on the under side. I do not know any name for them, either popular or scientific, but I suppose any herpetologist would readily identify them from the above description.—*Charles Aldrich, Webster City, Iowa, May, 1881.*

THE BLUE JAYS.—These birds remain with us all the year round, notwithstanding the temperature of *minus* twenty-nine or thirty degrees which we sometimes have in our long "blizzard" winters. Supposing from their continued presence here that the bird is a resident, and not at all migratory, I was not a little surprised to-day to see a large one feeding another about one-third smaller in size. A member of my family had witnessed a similar act a few days ago. It occurred to me that possibly this might be an old bird with its young, which had been reared in some warmer region during the past winter. Migrating here, the young birds were only receiving the care they would seem still to need. It would seem hardly possible that the old bird had been taking care of this one all winter, else we should have seen something of the kind before. It is an unusual thing, I think, for old birds to be seen feeding young ones at this season, when most species are building their nests.—*Charles Aldrich, Webster City, Iowa, May 12, 1881.*

DOES THE CROW BLACKBIRD EAT CRAYFISH?—One of my students, who has during the past summer been making some observations upon the nature of the food of the "crow" blackbird (*Quiscalus purpureus*), brought me to-day the contents of one of their stomachs, and wished to know what kind of seeds they were that were mixed with the remains of insects, &c. Upon examination I found that the so-called "seeds" were gastroliths, or stomach stones of the crayfish. There were twenty-six of these stones

in the stomach of that one bird, with no other traces of crayfish remains. I can hardly believe that the bird had eaten thirteen crayfishes, or if it had, that the gastroliths should be all that remained of them in the stomach. Can it be that the bird finds these objects so plenty about the water's edge that it swallows them to serve as general stones in the "gizzard?" Since Mr. Aldrich has shown (see the October NATURALIST) that this bird feeds upon live fish, it may be that it also eats the crayfish, but even that supposition would hardly account for the presence in its stomach of so many of these peculiar bodies, with none of the other parts.—*F. E. L. Beal.*

AVIAN RIDERS.—Dr. Merrill's interesting account of the belief of the Crow Indians that a small bird, probably a grebe, performs its migration on the back of the sandhill crane, was no doubt new to our readers. It appears, however, that a similar belief is widely spread among various tribes of North American Indians. Dr. Merrill's account referred to the Crows, but he mentioned also that the Crees entertained the same belief in reference to the white or whooping crane. Recently, in the London *Nature*, Mr. John Rae gives an account of the supposed passage of certain small birds on the back of the Canada geese, as related by the northern Indians, which he apparently believes in.

It is generally asserted by the Naskegon Cree Indians, who dwell about the south-western part of Hudson's bay, that a small bird, one of the Fringillidæ, performs its northward migration in spring on the back of the Canada goose (*Bernicla canadensis*).

This species reaches Hudson's bay about the last of April, and the Indians state that when the geese are fired at the little birds are seen flying away from them. The Indians in this region devote considerable time each spring—a month or more—wholly to goose shooting, and their method of doing this is to set decoys near a blind and to call down the geese as they are passing over. It is inferred from this that such geese having rested upon the ground or having passed near by it have been deserted by their little passengers.—*Forest and Stream.*

THE MIGRATION OF BIRDS.—In a valuable article on this subject in *Scribner's Magazine* for October, Mr. J. A. Allen concludes: 1st. That the habit of migration resulted from changes of climate occurring at a not very remote geological period. 2d. That every gradation exists between species the most widely roving and those which are strictly sedentary; and that even representatives of the same species may be either migratory or sedentary, according to whether they occupy, as breeding stations, the northern or southern portion of the common habitat. 3d. That failure of food induces a movement towards warmer regions. 4th. That the return of birds to their breeding stations, which are their only true homes, is prompted by the recurrence of the season of procreation and

strong home affection. 5th. That they usually pursue definite routes, and are guided in part by prominent landmarks, or by memory, and in part by "instinct" or inherited experience. 6th. That erratic movements are the result of transportation by storms. 7th. That birds discern approaching meteorological changes.

THE CLAW ON THE INDEX DIGIT OF THE CATHARTIDÆ.—Birds form such an eminently distinct group in the present age—one so thoroughly isolated from any of the other natural divisions, that the discovery of any new factor in their anatomy, belong to what system it may, that tends to bring them nearer, by structural affinities, to one or the other of the great classes in nature, must always be regarded with peculiar interest by comparative anatomists. A prominent example, of this, familiar to all of us, presents itself in the discussions and special attention that the remains of *Archæopteryx macrura* has always received from such of us as are interested in special homologies, and by naturalists generally.

The writer has been recently engaged in collecting together, from various sources, material from which he hopes, at no distant day, to produce a monograph upon the osteology of the Cathartidæ. Not long ago a skeleton of *Catharista atrata* was obtained, through the kindness of Mr. Robert Ridgway, from a friend in Florida—after it had been received at the Smithsonian Institution. Mr. Ridgway and myself were examining it together, discussing in a casual way some of the bird's osteological bearings, and features, when my ornithological friend called my attention to an appendage at the extremity of the index digit—an addition to this vulture's skeleton, that was at once recognized as a delicate and freely articulated *claw*. Our surprise was mutual, and an examination of the many specimens of vulturine birds, skins and skeletons, that the Museum afforded, and which were within our easy reach, was at once inaugurated. The results of this and subsequent studies of the hands of these birds, it is my object to record in the present paper, believing as I do, that this feature has thus far escaped the scrutiny of descriptive ornithologists. Moreover, I cannot recall any representative of our avi-fauna that exhibits any such addition to the ordinary bones of the manus—in fact, the examples of birds in which it exists, are by no means common. We are all well aware that several genera of plovers, found in different localities over the world, can boast of a spur attached to the manus below the carpal joint, usually, I believe, on the metacarpal bone. This is also the case in *Parra jacana* and Palamedea, and others, but in these birds, as I have just stated, it is essentially an immovable *spur*, the counterpart of the same appendage as found on the posterior aspect of the tarso-metatarsus in the common barn-yard fowl and game cock—and as in these birds, often used as a weapon of attack during the breeding season.

So we must regard these spurs as nothing more than weapons possessed by a limited number of favored genera, given to them for a definite purpose, as hard as it is for us to conceive why some birds should wear them, to the exclusion of others—but claws, particularly as they occur in the Cathartidæ, have a very different significance,—they may mean a great deal more. They are to all intents and purposes, useless to their owners—and the problem simply presents itself to us, as to how they came by them—when did they first appear, and how? what are they the rudimentary remains of? and much more that may forever be purely conjectural ground for us, but certainly constituting a view of the subject that lies beyond the scope of such an essay as this, to treat or enter into.

The only authority that comes to my mind at present, who describes these affairs in any general way, is Professor Owen, and this writer dismisses the subject in the following manner:

"The index digit in Struthio and the medius digit in Apteryx, support each their claw. The claw or spur, when present in other birds, *e. g.* Syrian Blackbird *(Merula dactyloptera)*, spur-winged goose *(Anser gambensis)*, knob-winged dove (Didunculus), jacana *(Parra jacana)*, mound-bird (Megapodius), screamer (Palamedea), is developed from the radial side of the metacarpus, or from the index digit. The screamer has two spurs, the homotypes of the metatarsal ones in *Pavo bicalcaratus*. The claw upon the index of Archeopteryx was curved and sharp; and the remains of the unique example of this ancient fossil bird make it probable that the hand had a second free unguiculate digit, perhaps the homolodge of the pollex. Although the instances of these weapons, and the occasional use of the wings in birds not so armed, *e. g.* the swan, show them in the light of means of attack, the bones of the pectoral limb in birds are modified mainly for volant action."

At the present writing there are two rather imperfect skeletons of *Pseudogryphus californianus*, and two mounted specimens, the latter being unquestionably "birds of the year," in the Smithsonian Institution. In the younger, or at any rate the smaller of these last, we find this claw present and very prominent, though it occurs in both birds. It can be immediately brought into view and examined, by simply parting the feathers that overlie the region of the first finger, whereupon it will be found to be a strong curved claw—convex anteriorly, sharp, slightly grooved from above downwards on its posterior aspect, covered by the same kind of horny integument, or thecæ, that shields the bony claws of the feet, and movable. It measures in this case, along the axis of the curved anterior surface, something over a centimeter (about 1.3 centimeters), being grasped about its base by the common integuments of the upper extremity. Its horny sheath being removed, it leaves an osseous claw, such as we find in the

distal or ungual points of the feet; this has a transverse facet at its base, that articulates with a similarly placed surface at the extremity of the index digit, rather towards its outer side. It is supported in addition to the aid the common skin affords, by ligaments attached to the bone above. It is not uncommon to find a slight inequality in size, when the claws of the two sides are compared in the same specimen—this remark holds good for other individuals of the family. No doubt, when we come to examine a larger series of specimens, this appendage will be found to differ in size according to the age, or perhaps in some cases the idiosyncrasy of the individual. In *Sarcorhamphus gryphus*, it was seen to possess all of the characteristics just described as they occur in our Californian Condor, only that in the first it was not found to be nearly so large, nor so much curved. It does not appear to attain any very great size in *Sarcorhamphus papa*, where also it becomes still less curved.

In a specimen of *Catharista atrata* that I have before me, this claw is subcompressed from side to side, sharp behind, rounded anteriorly, slightly curved from before, backwards, and occupies a facet on the anterior third of the extremity of the index digit. In other birds examined of this species, this rule was departed from, in the claw being apparently less curved, and flatter; in this seemed to be its constant condition in *Cathartes aura.*

Turning to the vultures of the Old World, which we are aware have been placed with the Falconidæ, this claw could in no instance be found; neither Neophron, nor *Gypogeranus serpentarius* exhibit any such feature, in short, it seems to be confined, as far as the vultures are concerned, to our family of Cathartidæ, and as here developed, constitutes an additional character, referable both to external features and internal structure, for deferential diagnosis, separating these birds from the Old World vultures. —*R. W. Shufeldt, M. D., Washington, D. C.*

The Paper Nautilus again in New Jersey.—I have to report for the third time, the discovery of an Argonauta on the New Jersey coast. It was found in September at Long Branch, the day after President Garfield's death, and near the cottage in which he died. The shell was fresh, its occupant having but recently perished. The two previously reported by me were found in August, 1876, one at Long Branch, containing the animal alive, and the other at Point Pleasant, about fifteen miles south. This, too, was a fresh shell. Thus, beginning with the summer of 1876, we may set down the Argonaut as belonging to the marine fauna of New Jersey; and query: As this beautiful creature is a native of the Tropics—"what's up!" Has the Gulf Stream got a new kink?—*S. Lockwood, Freehold, N. J., Oct. 12, 1881.*

Zoological Notes.—The type of a new family of fresh-water worms, remotely allied to the Lumbriculidæ and Tubificidæ have

been discovered by G. Eisen in a small rapidly flowing spring among the snowy peaks of the Sierra Nevada in California. The worm is described in a memoir, with two colored plates, in the Transactions of the Royal Society of Sciences in Upsala, for 1881. The worm is named *Eclipidrilus frigidus*, and the family Eclipidrilidæ.——The second part of M. Jules Macleod's contribution to the study of the structure of the ovary of Mammals refers to that of Primates. He has also published in the Bulletin of the Academy of Sciences of Belgium, abstracts of the results of his investigations on the reproductive apparatus of bony fishes, especially the ovary of Hippocampus and of Sygnathus.——It will be remembered that elephantiasis and other diseases allied to leprosy are supposed by Dr. Lewis and others to be contracted in India and China from drinking unfiltered and unboiled water containing the embryos of Filariæ, minute thread worms found in the circulation of leprous patients, which are introduced into man by drinking cold uncooked water, as well as by the mosquito, which serves as an intermediary host. Dr. P. Manson, of Amoy, has published in the Journal of the Queckett Microscopical Club, a notice of a chart recording a series of observations on the blood, temperature and pulse of two Chinese lads, ascertained to be filarious, and which were in the main made by themselves. He concludes, 1st, that the periodicity observed by the Filaria embryos is by no means an exceptional or capricious phenomenon; and 2d, that it is associated with the advent of night, not depending in any way on the sleeping state. Dr. Manson concludes as follows: "If the examination of filarious blood is made during the night, it is almost as easy to find the parasite as it is to find a white blood corpuscle. Seeing this, and the frequency with which the presence of the parasite is associated with lymphatic fever, elephantoid and other disabling affections, I have sometimes thought it would be worth the trouble for the government in India to institute the systematic examination of the blood of native recruits by their medical officers."——In the same periodical Mr. J. G. Waller argues that the so-called boring sponge (Cliona) does not make the burrows in which it is found growing, but that an Annelid is the factor. To this Mr. Priest demurs, who claims what is generally accepted by zoölogists, that the Cliona does the work. He thinks the protoplasm of the sponge acts on the surrounding parts, and eats its way into them, as the protoplasm of necrosis eats into bone.

ENTOMOLOGY.[1]

THE PERMANENT SUBSECTION OF ENTOMOLOGY AT THE RECENT MEETING OF THE A. A. A. S.—The Entomological Club of the A. A. A. S., which has had several most interesting and instructive meetings, was made a permanent subsection of the Associa-

[1] This department is edited by PROF. C. V. RILEY, Washington, D. C., to whom communications, books for notice, etc., should be sent.

tion at Boston last year, and with the adoption of the amendments to the constitution at Cincinnati, has become part of the Section (F) of Biology, and will meet in future, when the number of entomological papers will warrant, as a subsection thereof. At the recent meeting there were few papers presented; indeed, but a single title had been entered up to the first day, and the editor of this department, who had decided to enter none, owing to his duties as general secretary, was induced to change his mind, upon this discouraging showing. The distinctive feature of the club was its meeting a day in advance of the Association, when excellent opportunity was offered for the interchange of views and the exhibition and exchange of specimens. After the business of the Association once begins, there is so much to interest and occupy members that it is more difficult for the specialists to get together. In this one respect the merging of the club into the Association—the loss of its independence, so to speak—is a drawback; but we hope that it will not lessen the enthusiasm or interest of the entomologists of the country, who still have in the Association an incentive to annual reunions that cannot but prove both pleasant and profitable.

Among those in attendance were the chairman, Jno. G. Morris, the secretary, B. Pickman Mann, and Messrs. J. A. Lintner, Wm. Saunders, Wm. H. Edwards, J. D. Putnam, Cyrus Thomas, V. T. Chambers, S. H. Peabody, H. S. Jewett, Charles Dury, A. J. Cook, C. G. Siewers, Jno. A. Warder, C. D. Zimmermann, E. W. Claypole.

The following is a list of the papers entered and read:

Life-history of the Buckeye stem-borer, *Sericoris instrutana* Clem. E. W. Claypole.

Retarded Development in Insects. C. V. Riley.

New Insects injurious to American Agriculture. C. V. Riley.

The Egg-case of *Hydrophilus triangularis*. C. V. Riley.

On certain habits of *Heliconia charitonia*. W. H. Edwards.

On the Oviposition of *Prodoxus decipiens*. C. V. Riley.

The Cocoon of Gyrinus. C. V. Riley.

On the length of life of Butterflies. W. H. Edwards.

On the life duration of the Heterocera (moths). J. A. Lintner.

A remarkable invasion of Northern New York by a Pyralid insect, *Crambus vulgivagellus*. J. A. Lintner.

On an alleged abnormal peculiarity in the history of *Argynnis myrina*. W. H. Edwards.

How does the Bee extend its Tongue. A. J. Cook.

The Syrian Bees. A. J. Cook.

Carbolic acid as a preventive of Insect Ravages. A. J. Cook.

Suggestions of coöperation in furthering the study of entomology. B. Pickman Mann.

The subsection was opened by the reading of Mr. Edwards's paper on a singular habit of *Heliconia charitonia* Linn., recently observed by Dr. Wm. Wittfeld, near Indian river, Fla. In two in-

stances Mr. W. found three or four of these butterflies brooding, so to speak, over a chrysalis of the same species, clinging to it tenaciously by their legs, and resenting all attempts to frighten them away until the imago had issued from the chrysalis. This brooding would last for two or more days. We know of no similar action of a butterfly on record, and the statements elicited from Mr. Edwards in the discussion of his paper, left the impression that the butterflies could not have congregated around an injured chrysalis to obtain its juices, but that they really gathered around it for protection, on the hypothesis that the imago possessed some peculiar immunity from the attacks of birds and other enemies not possessed by the chrysalis. If this hypothesis should in future prove to be correct, the action of this species will denote a remarkable degree of intelligence in butterflies.

In the afternoon the genial and venerable president read his address, which contained feeling tributes to those entomologists who passed away during the year, and an admirable bibliography of the writings of the year by American entomologists. His allusion to the death of Professor S. S. Haldeman was quite tender, giving some reminiscences of years ago, when he and Haldeman were very intimately associated in favorite studies. He rapidly sketched some leading features of the scientific life of his late friend and delivered a eulogy upon his character appreciated by all who had any acquaintance with him.

Dr. M. also gave a sketch of the condition of entomology as it was 40 years ago, when there were not known to be more than 10 or 12 working entomologists in the country, whose names he enumerated. At present, there are 436 names reported in last year's Naturalists' Directory of persons who are designated as entomologists. There is no other distinct branch of zoölogy that has so many representatives in that book except geology and botany. The lists of all contributions to entomology for the last year in the various journals, exclusively by American writers, numbered 336, and of writers 80.

Mr. Edwards's paper "On the length of life of butterflies," showed, from his own experience of fifteen years, that the life in the imago state, in summer, spans but a few weeks, depending somewhat on the period when coition occurs; while those which hibernate as imagines may of course endure eight or ten months. Citing *Danais archippus* as an illustration, he criticised the statement in reference to it in Mr. Scudder's recent work on butterflies, where Archippus is made to live from twelve to fifteen months, and to oviposit only after hibernation. Mr. Edwards's experience shows that in West Virginia the broods of Archippus follow in quick succession to the number of three or four, and that during the summer the eggs are laid by young females soon after issuing from chrysalis. Mr. Riley stated that his experience in reference to this species in the Southwest, corroborated that of Mr. Ed-

wards, and expressed the belief that it did not hibernate at all in the Northern States but migrated to the South in autumn, and dispersed northward the ensuing spring and summer, and suggested that this fact, not appreciated by Mr. Scudder, would throw light on the history of the species in New England.

Mr. Lintner's paper on a somewhat similar subject, viz., the life duration in Heterocera, gave a long series of careful notes of collectings, from which he concluded that the average duration of moths is from two to three weeks in summer. The paper gave rise to some extended remarks from Messrs. Thomas, Mann, Riley and others. Mr. Thomas thought that the knowledge of the term of life in the imago was of less value, from an economic standpoint, than that of the individual in all its states. In endeavoring to ascertain this duration in *Leucania unipuncta*, he had come to the conclusion that it was about seventy-seven days. This conclusion, based on calculations from recorded appearances of the insect, was in opposition to the only actual experiments which are on record, viz., those by Mr. Riley in the Eighth and Ninth Reports on the Insects of Missouri, which show that the term of life in summer hardly extends over half as many days. In fact, all our experience as to the summer duration of life in this species shows that each state of egg, larva, chrysalis and imago will average ten days. Mr. Thomas argued that insects in confinement develop more rapidly than in freedom. Mr. Riley gave his experience as opposed to the statement: insects reared in confinement during the summer are likely to develop more slowly than in freedom, for the obvious reason that those in freedom get more sunlight, and constantly have a supply of fresh food at hand, and this will hold equally true with the changes that take place underground, for the mean temperature of the soil, during summer, is evidently greater outdoors than indoors. Experience shows, moreover, that in this question everything depends on the time of year, character of the weather and other surrounding conditions, there being a wide range in the duration of life in the same species.—*(To be continued.)*

The New Imported Clover Enemy.—In the September number we gave a brief record of the appearance in injurious numbers of *Phytonomus punctatus* Fabr., a common European Curculionid hitherto unknown in this country. In looking up the literature on the habits of the insects of this genus in Europe, we find much written on the history of the earlier states of several species. From what is known in Europe, it appears that the species of the genus show a unity of habit and mode of development. The greenish larvæ (recalling in general appearance those of Syrphus or of some Tenthredinid larvæ), feed in May and June on the leaves and flowers of the plants they infest, and spin in July a net-like cocoon on various parts of the plant, changing therein to

pupæ within eight to twelve days, the beetle issuing in July or August. Only one annual generation is recorded, the beetle hibernating. *Phytonomus murinus* Fabr., oviposits on the young shoots of Lucern *(Medicago sativa); Ph. meles* Fabr., feeds as larva and beetle on *Trifolium pratense* and Lucern, and proves injurious to the latter plant in some parts of Germany; *Ph. nigrirostris* Fabr. (which, by the way, occurs also, though rarely in the United States, from Canada and Massachusetts westward to Michigan), feeds as larva on *Trifolium pratense* and *Buphthalmum salicifolium*; *Ph. pollux* Gyllh. on *Silene inflata* and *Polygonum hydropiper; Ph. rumicis* Fabr., on various species of Rumex and also on *Polygonum aviculare; Ph. viciæ* Gyllh. on *Vicia sylvatica; Ph. plantaginis* DeG. on *Platago lanceolata* and *Lychnis dioica; Ph. polygoni* Linn., on young shoots of Dianthus and on *Polygonum aviculare*, the larvæ feeding on the leaves as well as on the blossoms and also boring in the stems; *Ph. suspiciosus* Hbst., on *Lotus uliginosus* and *Lathyrus pratensis; Ph. palumbarius* Germ., on *Mentha aquatica* and *Salvia glutinosa*. So far as known, the habits of the genus in this country conform to the above experience in Europe. We have reared *Ph. comptus* Say, from *Polygonum nodosum* upon which the larvæ and pupæ may be found in July, the cocoon having the usual net-work appearance. Of the nine species known to occur in this country (exclusive of *Ph. punctatus)* this is the only one whose habits have been observed, though, as above shown, those of *Ph. nigrirostris* have been recorded by European observers.

We had the pleasure of spending some time about the middle of August with Mr. L. D. Snook at Barrington, N. Y., who has suffered materially from the attacks of *Phytonomus punctatus*, and since—though it is so common abroad—little or nothing is on record of its habits, and since it has certainly never before been reported as injurious to agriculture, we give Mr. Snook's experience up to the time of our visit. In the latter part of April, he first noticed on a field of clover here and there, small patches where the leaves were badly eaten. The damage increased rapidly in extent, and by the end of July, the whole field (about seven acres) was badly infested, one corner of nearly two acres having scarcely a whole clover leaf remaining. Other fields in the neighborhood were attacked in the same manner, while an occasional field escaped injury. We found acres of his clover ruined, but in passing through the field none but an expert would suspect the cause, since the beetles were, as a rule, hiding on the ground or slightly beneath the surface, and the few that were feeding dropped and "played possum" upon the slightest approach, their color being so much that of the earth, that they are not easily observed. That they had been much more numerous earlier in the season than they then were, was apparent from the number of dead specimens more or less broken, and from the

cocoons which had generally been washed by the rains on to the ground and more or less embedded. Judging from European experience we anticipated no further multiplication the present year; but, to our surprise, the beetles have been continuously laying eggs from that time to the present writing (October 3d), and what is more singular, while some of the eggs have been laid externally to the plant either singly or in little groups, most of them have been secreted and thrust into the old and hollow stems. A few of the larvæ which hatched externally are now nearly full-grown, but those which hatched within the stalk, have fed but little and are evidently preparing for hibernation. Is this a normal habit in Europe, or is it a departure therefrom consequent upon the introduction of the species here? The latter seems quite probable since the habit of attacking clover injuriously is certainly new, if we may judge from the failure to indicate it by European entomologists. The probability is that the insect with us will hibernate both in the larva state within the stem and in the beetle state. In either event the larvæ will doubtless be found most numerous in northern New York in the month of May, and we recommend that clover fields in which it is found be heavily rolled at that season, as the best means of decreasing its injuries.

Without going into descriptive details, we would state that the egg is elongate-oval, about twice as long as wide, pale yellow, and smooth when first laid, but becoming greenish-yellow, and roughened with hexagonal depression before hatching. The average length is 1^{mm} and in most cases the larva has hatched in about one week from the time the egg was laid. The young larva is pale with a dark head, but subsequently becomes greenish with a distinct whitish medio-dorsal line relieved by darker shades each side. The body is deeply wrinkled, with prominent substigmatal and ventral swellings, the latter so well developed and so extensile that they perform the function of prolegs, giving the larva its strong resemblance to those of Tenthredinidæ, and enabling it to easily crawl or clasp the edge of a leaf. When at rest it clings sidewise and in a curved position to the leaf, usually on the underside, grasping the leaf hairs between the ventral swellings but especially in the transverse fold of the anus, by which it can hold and swing the whole body about as Syrphid larvæ are known to do. The surface of the body is sparsely beset with short stiff hairs, varying in number at different stages of growth. The largest specimen, evidently about full-grown, has up to this writing (October 3d) experienced three molts.—*C. V. Riley.*

CRAMBUS VULGIVAGELLUS.—This common moth which, as stated on page 750, is the parent of the worms that did so much damage to meadows in parts of New York. (See pp. 574 and 576.) has been excessively abundant all over the Eastern States this

year, and as Mr. Henry Edwards informed us, proved a positive nuisance in collecting in the neighborhood of New York city. Professor Lintner has published a full account of it in the *Elmira Husbandman* for Sept. 14, 1881, in a paper presented to the N. Y. State Agricultural Society. He has also obtained the eggs, and from them a second brood of larvæ. We found the egg-shells quite common in the earth from some sward sent September 12th, by Mr. Adams, from a field that had been devastated by the larva, and we have since readily obtained fresh eggs from moths captured in Washington. The eggs are pale yellow when laid, but become orange afterward; they are elongate-oval, very slightly broader at base than at top, and ribbed as in those of various butterflies, there being about twenty longitudinal, rather sharp ridges and about thirty less marked transverse ones. The average length is 0.7^{mm} and diameter 0.3^{mm}. They are dropped singly among the grass and on the ground.—*C. V. R.*

Larval Habits of Sphenophori that attack Corn.—For many years several species of the genus Sphenophorus have damaged the corn crop in various parts of the United States, more particularly at the south, where they are all known as "bill bugs." Glover, in 1855, spoke of their injuries, but did not determine the species. Walsh, in 1867 (*Pract. Ent.*, II, 117), described a species damaging corn in New York as *S. zeæ*, but which subsequently proved to be *S. sculptilis* of Uhler. *S. sculptilis* also occurs in the South and West, being common in Illinois and Missouri. It has also been received at the Department of Agriculture from Florida and Alabama, *S. robustus* from South Carolina, and *S. parvulus* from Missouri, all as injuring corn. The larval habits of all these species are unknown. Walsh surmised that *S. sculptilis* would be found to breed in decaying driftwood washed by water, the adults migrating to neighboring corn-fields, and some subsequent facts that have come to our knowledge lend weight to his hypothesis so far as this particular species is concerned.

In reference to one of the larger species (*S. robustus* Horn), which has done considerable injury to corn this year in South Carolina, Mr. L. O. Howard, whom we recently sent down there to study it, found that it actually breeds in corn. On the plantations along the bottom-lands of the Congaree and neighboring streams, as soon as the corn appears in the spring it is attacked by numbers of the adult beetles. Stationing themselves at the base of the stalk, and also burrowing slightly under the surface of the earth, they pierce the stalk and kill many plants outright, leaving others to grow up dwarfed and distorted. The whole field has frequently to be plowed over and replanted. The eggs are probably laid at this time or a little later, at or near the surface of the ground. The young larva, hatching, works downwards, and may be found at almost any age in the tap-root. A few individ-

uals work upwards into the first section of the stalk, but only, it would seem, after having consumed all available pith below ground.

At full growth the larva will have consumed the pith of the stalk for from four to five inches, dwarfing the stalk, preventing the make of the ear, and causing the lower leaves to turn brown and wither. The larva has the general characters of other described larvæ of the genus. The pupæ are found in cavities opposite the first suckers, surrounded by excrement compactly pressed so as to form a sort of cell.

The beetles make their appearance in the fall (one specimen issued as early as August 30), and hibernate as adults mainly in the stalks. The remedy then of cutting the stalks in fall or early winter and of plowing up and burning the stubble is obvious.—*C. V. Riley.*

Effect of Drought on the Hessian Fly.—It has long been known that the Hessian fly flourishes most when the Chinch bug flourishes least; in other words, that wet weather favors it. Moisture seems essential to the well-being of the larva. The prejudicial effect of drought has not hitherto been observed, that we are aware of, but was very noticeable the present year in parts of Ohio, where the puparia literally dried up. Our attention was first called to the fact of the general death of the insect in the "flaxseed" state by Mr. E. W. Claypole, of Yellow Springs, O., and our observations subsequently confirmed his experience. The intense heat had not only desiccated the Cecidomyia, but, what is still more remarkable, in most cases the parasites also. We should like to hear from Prof. Cook, of Michigan, and others, whether a like result followed the severe heat and drought in other parts of the West. The presumption is that the mortality was general and that farmers may expect immunity from injury for some years to come.

Simulium from Lake Superior.—In regard to the Simulium from Lake Superior, which we mentioned on p. 313, current volume of this magazine, Dr. Hagen remarks in the *Canadian Entomologist* (Vol. xiii, pp. 150–151), that upon examination of larvæ and pupæ, sent to him by Mr. H. G. Hubbard, they did not appear to differ materially from those of *S. pictipes*, but that the imagines from Lake Superior (which were not raised from the pupæ collected by Mr. Hubbard) differ from *S. pictipes* in their much smaller size and in the color of the legs.

Coleopterous Cave Fauna of Kentucky.—Mr. H. G. Hubbard has carried on during the past summer a careful investigation of the insect fauna of the different caves in Kentucky, especially near Cave City, and it is now pretty safe to say that the Coleopterous cave fauna of Kentucky comprises but two general viz: Adelops and Anophthalmus. Of the former genus only one

species has been found which seems to be equally common in all caves in that State, but Mr. Hubbard thinks that in Anophthalmus we may expect considerable increase in the number of species when all our caves shall have been explored.

HEMIPTEROLOGICAL STUDIES.—Dr. V. Signoret kindly sends us the first part of his "Revision du groupe des Cydnides de la famille des Pentatomides," from the *Annales de la Société Entomologique de France* for 1881. It contains a review of what has been done in the classification of this family by former authors, a characterization of the family, table of genera (forty-three in number) and the beginning of the description of the species from all parts of the globe. Two plates accompany this part.

ENTOMOLOGY IN BUFFALO, N. Y.—We are very glad to see that the publication of the Bulletin of the Buffalo Society of Natural Sciences has been resumed after a lapse of several years. Vol. IV, No. 1, has just been issued and contains the following entomological papers: List of Coleoptera observed and collected in the vicinity of Buffalo, by F. Zesch and O. Reinecke; New Coleoptera, by John L. LeConte, M.D. (*Elaphidion imbelle*, *Oeme gracilis*, both from Poway, Cala., and *Myodites zeschii*, from Buffalo); Observations and Notes (on *Eudryas unio*, *Smerinthus modesta*, *Hylesinus trifolii*, *Cossus robiniæ*, *Papilio thoas*, *Thyreus abboti*). One plate accompanies this number, but we must confess that figures III and IV thereof are quite poor and inaccurate.

LAMPYRIDÆ.—Dr. LeConte has been kind enough to send us a copy of his long-expected "Revision of the N. A. Lampyridæ." This paper will no doubt be very welcome to every coleopterist in our country, as it renders determinations possible in a somewhat neglected but interesting group of beetles. We hope that it will serve to call attention to the many interesting points in the life-history of the Lampyridæ proper, yet to be made out.

SEVERE COLD AND HIBERNATING APPLE-WORMS.—Prof. A. J. Cook records having found that the larvæ of *Corpocapsa pomonella*, which hibernated under natural conditions, *i. e.*, in their silken cocoons in the cracks and crevices of the trees, had succumbed to the severe cold of last winter, while those hibernating in cellars and kitchens survived.

ANTHROPOLOGY.[1]

TEMPORAL PROCESS OF THE MALAR BONE IN ANCIENT HUMAN CRANIA.[2]—A noteworthy anatomical and possibly anthropological feature of a large proportion of the crania from the well-known ancient cemetery near Madisonville, Ohio, is the presence of a

[1] Edited by Prof. OTIS T. MASON, 1305 Q Street, N. W., Washington, D. C.

[2] The Temporal Process of the Malar Bone in the ancient human crania from Madisonville, Ohio, by F. W. Langdon, M.D. Read before Am. Assoc. for the Adv. of Science, at Cincinnati, Aug. 22, 1881.

spine-like or occasionally unciform process, situated on the posterior border of the malar bone and partially covering in the temporal fossa.

This projection, for which the writer proposes the name *temporal process*, is somewhat triangular in form, its base, which is from 7 to 18^{mm} in length, being continuous with the middle third of the posterior border of the bone; it tapers somewhat rapidly to its rather obtuse apex, its average length being a little over 5^{mm}.

A similar process is of occasional occurrence in negroes and mulattoes, and further observations as to its distribution and frequency in various races would doubtless be of interest. The accompanying figure illustrates a fairly developed specimen as seen in many of the Madisonville crania.[1]

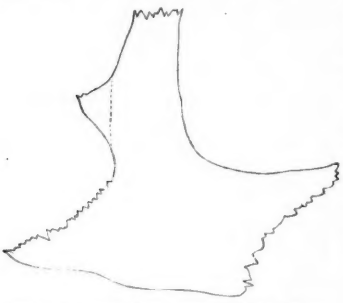

FIG.—Temporal Process of Malar Bone.

[The process described by Dr. Langdon may be noticed in plates 11, 12, 13, 15, 17, 18, 19, 23, 25, 28, 30, 31, 37, 41, 47, 55, 62 of Morton's Crania Americana. It is also a marked characteristic in many crania of the Army Medical Museum, belonging to many tribes and both sexes. It is not mentioned in any work with which we are familiar, and is worthy of further notice since it has been observed in such a large homogeneous group as the Madisonville find.—*Ed. Am. Nat. Anthrop. Dept.*]

A PREHISTORIC CUP MADE FROM A HUMAN CRANIUM.—A somewhat remarkable and possibly unique specimen of aboriginal handicraft has been recently exhumed by some curiosity-seeking boys, near Cedar Grove, Indiana, a small town situated on the Whitewater, about thirty-seven miles north-west of Cincinnati. On the 10th of October, 1880, they discovered a human skeleton, and with it, instead of the earthen pot so often found with such remains, was a cup or bowl made from a child's skull.

The skeleton, as described to the writer by one who assisted in taking it out, was in a sitting position, facing north-west, with the vessel at the left side on a level with the hips. The bones of the right hand and arm were missing, but I think had fallen with earth into a gully which had washed out on that side. The skeleton, which is that of an old and rather tall man, is in a fair state of preservation.

The vessel, or drinking cup, is, evidently, from its small size

[1] The dotted line indicates the ordinary contour of the posterior border of the bone.

and plainly marked sutures, the skull of a child. The base of the skull has been roughly cut away and scraped smooth, leaving an irregular margin or rim to the vessel. Both the inner and outer surface has been scraped with some rough-edged tool, leaving numerous scratches. Two holes were drilled through the side, near the upper part of the cup, for the purpose of mending a crack by tying the fractured parts together. A portion of the frontal bone was accidentally broken away by a stroke of the spade. This curious relic of barbarism is now in the collection of the writer, as is also the well-preserved skull with which it was found. Along the gully before mentioned, and within a few feet of these remains, were found parts of three other skeletons.

It may be added that the place where they were found, has, for many years, been known to be an aboriginal cemetery.

The situation is on the highest terrace formation, about one hundred feet above and immediately overlooking the Whitewater. The soil is compact clay about two feet thick, overlying clean, white sand, in which the bones were found.—*Edgar R. Quick in Jour. Cin. Soc. Nat. Hist.*

ANTHROPOLOGY AT THE AMERICAN ASSOCIATION.—Although the dread of a terribly hot wave deterred many of the older members from going to Cincinnati, the meeting was very largely attended. The department of anthropology, inspired by the environment, drifted into archæology. It is to be hoped that the next meeting will witness a greater diversity of subjects. All the papers read are given below, with the name and address of the author, so that the readers of the NATURALIST may, if desired, put themselves in correspondence with them:

Mallery, Col. Garrick (Washington, D. C.)—Opening address before the permanent sub-section of anthropology. Subject: The Gesture Speech of Mankind.

Mason, Otis T. (Washington, D. C.) — The uncivilized mind in the presence of higher phases of civilization.

Horatio Hale—A lawgiver of the Stone age.

———The history of Hiawatha.

Holbrook, Watson C. (Lebanon, O.)—Mound-builders' skeletons.

———Prehistoric hieroglyphics.

———Stone implements of the drift.

McAdams, Wm. (Otterville, Ill.)—The stone images and idols of the mound-builders.

———Some remarkable relics from the mounds in Illinois.

Dall, Wm. H. (Washington, D. C.)—On the inhabitants of N. E. Siberia, commonly called Chukchis and Namollo.

Henderson, Hon. J. G. (Winchester, Ill.)—Houses of the ancient inhabitants of the Mississippi valley.

———Was the antelope hunted by the Indians on the prairies of Illinois?

———*Ilex cassina*, the black drink of the Southern Indians.

———Agriculture and agricultural implements of the ancient inhabitants of the Mississippi valley.

Smith, Mrs. Erminnie A. (Jersey City, N. J.)—Comparative differences in the Iroquois group of dialects.

———Animal myths of the Iroquois.

Morse, Edw. S. (Salem, Mass.)—On the ancient Japanese bronze bells.

———On worked shells in New England Shell-heaps.

Hoffman, W. J. (Washington, D. C.)—On the interpretation of Pictographs by the application of gesture signs.

Trowbridge, S. H. (Glasgow, Mo.)—Exhibition of some archæological specimens from Missouri.

Langdon, Frank W. (Cincinnati, O.)—The temporal process of the malar bone in the ancient human crania from Madisonville, Ohio.

Peet, Stephen D. (Clinton, Wis.)—The emblematic mounds on the four lakes of Wisconsin.

———Buffalo drives on the Rock river in Wisconsin.

De Haas, Wills (Washington, D. C.)—The Mound-Builders; an inquiry into their assumed southern origin.

The greatest attraction, however, to the anthropologists, was an excursion by train to Madisonville, a few miles north of Cincinnati. The readers of the NATURALIST had been told so much concerning this wonderful locality, that about three hundred persons went to the ground to examine for themselves. There, in brief, they witnessed what a few determined gentlemen can do with limited resources. On a long tongue of land, bounded on all sides but one by deep and precipitous ravines, is the ancient cemetery. Beginning at the top end of the bench, the explorers have excavated about two acres to a depth of six feet, throwing the earth through sieves. Upwards of five hundred skeletons have been exhumed, accompanied with the usual vessels, etc. But the distinguishing feature of the cemetery is the ash-pits, cavities in the earth several feet in depth, where layers of earth and ashes alternate, but there are no evidences of fire in them. The implements in the pits, formed of bone and antlers, are as wonderful as the pits themselves. Many beautiful collections have sprung from this digging, among them we mention those of Dr. C. L. Metz, the Hon. Joseph Cox, Mr. C. F. Low, Dr. F. W. Langdon, Mr. E. A. Conkling, in Madisonville, and those of the Museum of the Society of Natural History and the private collection of Dr. H. H. Hill, in Cincinnati. The last named gentleman has, without doubt, one of the most extensive and intelligently classified private museums in the West.

ANTHROPOLOGY IN FRANCE.—There comes over us, when a great man dies, a momentary feeling of despair. What will science do now, we said, when Dr. Paul Broca laid down his pen? But into the great gap his pupils throw themselves, and the good work goes on. The July number of *Revue d'Anthropologie*, after an opening article by Dr. Broca, passes on to give us the accustomed rich and varied feast, the list of whose good things will be found below:

Broca, Paul—La Torsion de l'Humérus et le tropomètre, 386–425.

Betz, Wladimir (Professor a l'Universitié de Kiew)—Sur la structure de l'écorce cérebrale. A la Mémoire de Paul Broca.

Chassagne, Amédée—Contribution a l'Ethnographie de la Basse-Bretagne, avec cartes, 439–447.

Maget, Dr. G.—Sur les moeurs des Japonais.

Féré, Ch.—Nouvelles recherches sur la topographie cranio-cérébrale, 468–487.

Deniker, M.—A review of Weisbach's "Körpermessungen verschiedener Menschemassen," Berlin, 1878, pp. 448–502. [This is a very minute and valuable review of a work not in the hands of many American anthropologists.]

Zabarowski—Review of the following works: [Ernest Chantre, "Premier Age du fer.—Necropoles et tumulus" (1 vol. gr. in 4to, pp. 57, with album in folio, 50 plates.——Baron J. de Baye, "L'Archéologie préhistorique. Epoque tertiaire. Epoque quaternaire. Transition entre les deux epoques de la pierre. Epoque néolithique. Grottes artificielles de la Marne. Grottes à sculptures. Sépultures. Trepanation préhistorique. Fleches à tranchant transversal, etc." 1 vol. gr. 8vo, pp. 412, figs., Paris, 1880.——Urban & Virchow, Cemeteries of Gross-Lichterfeld, at Berlin," *Zeitschr.*, 1879, p. 342.——Dr. Anger, "The mixed cemetery of the plain of Neustadt near Elbing," *Zeitschr.*, 1880, II, p. 166.] pp. 503–516.

Topinard, Dr. Paul—Review of Tylor's "Anthropology."

Manouvrier—Review of the following: Enrico Morsalli, "Critique and reform of the methods of anthropology, founded upon laws statistical and biological, and upon experience," Rome 1880.

Lesson, H. and L. Martinet—Les Polynesiens, leur origine, leurs migrations, leur langage. Paris, E. Leroux, 1880. Reviewed in *Rev. d'Anthrop.*, IV, 1881, 524.

Zabarowski—Association française pour l'avancement des sciences. Session d'Alger, 1881. Section d'Anthropologie." pp. 530–536.

Manouvrier—Reviews the following: [Ettore Regalia, "Les anomalies numériques des vertèbres chez l'homme et leur interprétation."——Cesare Taruffi, "Observation du géant Chawang-in-Sing."]

Ten Kate—Review of Gegenbauer's "Discussion of the lachrymal bone in man, in *Morphologisches Jahrbuch*.

Kuhff, G.—Review of Dr. E. Schmidt's Kraniologische Untersuchungen,

GEOLOGY AND PALÆONTOLOGY.

EOCENE PLAGIAULACIDÆ.—This remarkable family of *Marsupialia* belongs, as is well known, to the Jurassic period, and genera have been found in both Europe and North America. Falconer traced resemblances to the existing *Hypsiprymnus* of Australia, and there might be some remote affinity between the families. But in the formations which represent the long period between the Jurassic and present ages, no trace of intervening genera has been found. It is therefore of interest that I am able to announce the discovery of such a one from the Lowest Eocene (perhaps Puerco) beds of New Mexico. The specimen was found with the jaw of the *Tritsodon quivirensis* (NATURALIST, for August, 1881), and consists of a single tooth of the lower jaw. It is the characteristic obliquely ridged cutting tooth well known in *Plagiaulax*. It presents the following differences from those of *Plagiaulax* and *Ctenacodon*, which I regard for the present as generic.

Char. gen. Cutting edge convex and continuous with the anterior edge of the crown, and serrate from the union of ridges which ascend on each side. Ridges curved backwards, all reaching the edge excepting above the posterior root of the tooth, where they are discontinued, leaving a smooth edge. In *Plagiau-*

lax the ridges are continued to the posterior edge of the crown, and in *Ctenacodon* the ridges do not extend on the sides of the crown. In *Hypsiprymnus* the ridges are vertical.

Char. specif. The tooth is much larger than that of any of the *Plagiaulacidæ* yet known, exceeding the corresponding one of the kangaroo-rat of Australia. There are twelve ridges on the side of the crown, extending from the base. They are crowded anteriorly and become more widely spaced posteriorly. The anterior margin is acute from near the base; the latter projects a little beyond the root. The most elevated point of the crown is between the roots. Ridges fine, enamel smooth. Length of base of sculptured part of crown, .0062; elevation of do., .0047; thickness of do. at base, .0025. The genus and species may be called *Ptilodus mediævus.—E. D. Cope.*

Belodon in New Mexico.—Some years ago[1] I identified certain fossils discovered in North Carolina by Emmons as Belodons; and later,[2] referred a species found by Wheatley in Pennsylvania, to the same genus. I am now in a position to prove that the genus ranged over the Rocky mountains, and that there, as in other parts of the world, it haunted the shores of the Triassic seas and lakes. In the same region a related form, the *Typothorax coccinarum*, existed at the same period.[3] There are two species of *Belodon* in my New Mexican collections, one as large as the gavial of India, the other smaller. In the former the muzzle is keeled above, and rises into a crest in front of the nares. In the other species the muzzle is subcylindric, and does not rise anterior to the septum of the nostrils. The larger species I call *Belodon buceros;* the smaller one *B. scolopax*, and define them as follows:

Belodon buceros.—Size of the gavial. Muzzle slender, compressed, with a narrow median superior ridge, rising at the middle of the length into a compressed crest, whose summit is in the plane of the frontal region. Nostrils a little further anterior to the orbits than the diameter of the latter, longer than wide, and separated by a thin septum. Orbits round, looking a little upwards, the interorbital region a little narrower than each orbit. Preorbital region compressed; preorbital foramen large, inferior. The quadrate bones are directed forwards, and their articular faces are in the transverse line of the two rather narrow notches of the posterior outline of the parietal bone. The auricular meatus is bounded by a descending hook-like process; and the squamosal bone is continued still further posteriorly into a short triangular acute horn. The superior surface of this bone with the parietal and frontal, are roughened with tubercles. The palate has a strong ridge on each side, so as to be grooved. The posterior teeth have

[1] Proceedings Academy of Natural Sciences, Philadelphia, 1866.
[2] Transactions Amer. Philos. Soc., XIV, 1869.
[3] Cope, Report G. M. Wheeler, U. S. Surv. W. of 100th Mer., IV., 1877.

compressed denticulate crowns. Tip of muzzle lost. Total length preserved, M. .700; length of muzzle to posterior edge of nares, .420; do. from latter to lines of anterior edge of orbits, .060; do. from do. to posterior parietal notch, .160. Width at posterior border of quadrate condyles, .240; interorbital do., .048; do. at slender part of muzzle, .045. Depth of slender part of muzzle, .050; do. of elevated part, .120; do. at parietal region, .140.

This species is of the size of the *B. kapfi* Meyer, and is, in the form of the muzzle, intermediate between that species and the *B. plieningeri.*

Belodon scolopax. This species is represented by a snout, which includes the anterior border of the nares; it is broken into five pieces, which should be connected with intermediate fragments, which are lost. This muzzle is a little shorter than that of *B. plieningeri,* but is a good deal more slender, the distal part having only half the diameter of the latter. Besides this character, it differs from that of *B. plieningeri* in three others. The extremity of the muzzle is not so much decurved. All the alveolæ have a more lateral exposure, and the lateral ridges of the palate are thus more distinctly seen from the side. The two teeth on the extremity of the muzzle are closely crowded together, and their large alveolæ are scarcely distinct.

The surface of the muzzle is distantly and weakly grooved and punctate. The anterior alveolæ are round, the posterior ones oval. Diameters an inch anterior to nares; transverse, .0230; vertical, .0235. Diameters three inches from extremity; transverse, .019; vertical, .0145.

Geological Notes.—The third part of the Contributions to the Palæontology of Austro Hungary, by Mojsisovics and Neumayr, contains two articles. These are, the Jura formation of the neighborhood of Brünn, by V. Uhlig; and the fossils of the Nizniow Limestone, by Von Alth.——The *Palæontographica,* for June, 1881, consists of a memoir on the extinct Elephants of Japan. The species mentioned are *Stegodon clifti, S. insignis, Elephas namadicus* and *E. primigenius.* The August number contains the first part of a memoir on the fauna of the Kelheim Diceras limestone.——Mr. Hulke, in the Quarterly Journal of the Geological Society of London, for 1879 and 1880, has described two new *Dinosauria* of the *Iguanodontidæ,* under the names of *Vectisaurus valdensis,* and *Iguanodon prestwichii.*——The *Revue Scientifique,* of Paris, gives a review of the last year's progress in vertebrate palæontology. It covers five pages and a half, of which one page is given to South American and four pages to North American works on the subject.——Prof. Cope's Palæontological Bulletin, No. 33, contains descriptions of fourteen new species of Mammalia from the Lowest Eocene beds of New Mexico. Eight new genera are characterized.——In the Bulletin of the Geological Society of France, M. Fischer describes a new Eocene Creodont under the

name *Apterodon gaudryi.*——Dr. H. G. Seeley has recently re-examined the vertebrate fossils found at Neue Welt, near Vienna, and has made a number of important rectifications in the determinations.

GEOGRAPHY AND TRAVELS.[1]

THE OGOWÉ AND CONGO ROUTES TO STANLEY POOL.—The Royal Geographical Society's Proceedings, for August, gives some interesting details concerning M. de Brazza's expedition up the Ogowé. The ulterior object of this expedition was to open a route from the Ogowé to the Congo above the cataracts, and launch steam vessels on the navigable part of the latter stream. "The station founded at Ntamo [Stanley Pool] is intended as the starting point of the steam vessels which are shortly to be placed on the Congo, while that on the Passa affluent of the Upper Ogowè is the nearest point to the Congo which could be placed in direct communication by water with the Atlantic Ocean, some 435 miles distant. On his first expedition it took M. de Brazza two whole years to reach the Passa, which was previously unknown, and the obstacles to free commercial intercourse on the Ogowé were great, as the river was divided into three distinct sections, held respectively by the Inenga and Galoa tribes, the Okandas, and lastly the Adumas, each of whom exercised absolute control over their own section, so that three changes of porters and canoes were necessary, and the value of merchandise was thus enormously enhanced. But during his last journey M. de Brazza put an end to this arrangement which had existed from time immemorial, and made the navigation of the river free as far as Franceville, his station on the Passa. With regard to the 180 miles of land journey thence to Ntamo on the Congo, porters will be found as easily along the road as on the banks of the Ogowé, for the population is very dense and peaceable, and the surface of the country presents no serious difficulty; indeed were it not for some obstacles in the first three days' march, a wheeled vehicle might pass along the road without any preliminary labor being necessary. The country, moreover, is very healthy, as it consists of a plateau at an elevation of 2625 feet, and this altitude affects the vegetation beneficially, so that the banana and maize flourish there. But this line of land communication from one station to another is only a provisional expedient, for the route to be used in the future will touch the Congo at a point much nearer to Franceville. This route, by which the steam vessels will pass down to the Congo, is the river Alima, which in his former expedition M. de Brazza discovered at a point only forty-five miles from the Ogowé. The tract of country between Franceville and this point on the Alima is not difficult and, indeed, is almost practicable for laden wagons without any previous labor being

[1] Edited by ELLIS H. YARNALL, Philadelphia.

expended on it. Having traversed it five times already, M. de Brazza is able to speak confidently on the subject. The country is not wooded and the vegetation is sparse, the hills have a gentle slope and a wheeled vehicle could pass everywhere."

"M de Brazza justly prides himself on having been able to accomplish, without violence of any sort, the total abolition of the slave trade in the basin of the Ogowé. Franceville has already become a place of refuge for escaped slaves, and M. de Brazza states that all the tribes along the river recognize this right of asylum and admit that all slaves who place themselves under his protection are thereby made free." He speaks discouragingly of Mr. Stanley's operations, believing that his road on the north bank of the Congo will never become a practicable highway. "In a former geological age an immense plateau, at an elevation of more than 2000 feet above the level of the sea, separated the Upper Congo from the Atlantic; the river wore a bed for itself through this plateau, which at last, by the action of constant and continuous drainage, became furrowed into as many valleys as there were torrents rushing down into the great river. In following the line of the Congo, therefore, it becomes necessary to cross all these chains of mountains, which are the remains of the ancient plateau." * * * * "By the line of the Ogowé, the river is made use of as far as it is navigable for canoes, from which point it is but forty or forty five miles through an easy country to a point where the Alima is navigable for steam vessels. On this line, too, labor and provisions are drawn from the country itself, while on the Congo nothing but rocks and dry grass are to be found. Not only are the men of Mr. Stanley's expedition fed on rice from Europe transported on the backs of porters and mules, but the animals themselves are fed on hay and oats obtained from Europe at heavy cost." Mr. Stanley is compelled to obtain men from Zanzibar, but few of the natives being willing to work, while "at Franceville, on the other hand, the neighboring villages sent men to build the houses, and when M. de Brazza, in July of last year, had to send down the coast for supplies, the 750 Adumas who manned the canoes were only accompanied by one European and two Gaboon men. The natives here are paid in goods after working for three or six months. Sufficient labor could be procured on the spot to carry out any works between Franceville and the coast as well as between the Ogowé and the Alima, and this essential difference between the two routes is due to the Ogowé region being well peopled and the country fertile and new to European merchandise."

The French Government has organized another expedition, supplied with steam launches, to ascend the Ogowé to assist M. de Brazza, which, at last advices, had arrived on the coast.

THE GREAT ANDES OF THE EQUATOR.—Mr. Edward Whymper has recently read a most interesting account of his journey in Ecuador before the Royal Geographical Society. It is given in full in the Proceedings for August. We have space here for only two extracts, the first relating to one of the principal objects of his journey; the comparison of the working of aneroid against mercurial barometers at great elevations, and also the value of calculations based on the boiling point of water; and the second regarding the glaciers of the Ecuadorian Andes. To test the value of the aneroid barometer, Mr. Whymper took with him eight instruments carefully selected, after a trial of twelve months, from a number of others.

"Upon leaving England they were well together, the greatest difference between them being about the eighth of an inch, or more exactly, .13. The value of this difference at the level of the sea amounts to about 100 feet; and if the mean of the whole had been taken, there would have been an infinitesimal difference between it and the reading of a standard mercurial. But by the time I arrived at Guayaquil this difference had increased to .35; on arrival at Guaranda [8900] it had still further risen to .74; at our first camp on Chimborazo [14,300] it had mounted to .88, and at our third camp [17,200] to 1.2 inch. These were the differences of those which held closest together, rejecting those which had clearly gone mad. They differed amongst each other at starting to the extent of 100 feet, and by the time we had risen to 17,000 feet, this difference had increased to about *two thousand* feet. If you consider that these were not aneroids selected at random, but were the pick of a number which had been expressly constructed for the journey, I think you will feel that this experiment conclusively demonstrated the uselessness of expecting to obtain absolute determinations of altitude from any number of aneroids; and, expensive as the experience was, I do not consider it dearly gained, as it decided that matter so far as I desire to pursue it, for once and all. The best of all ways to settle whether altitudes can be deduced with accuracy from the indications afforded by the boiling-point of water, would of course be to conduct a series of experiments on the boiling-point at positions the height of which had been determined with scrupulous accuracy trigonometrically; but the opportunities of doing this at great elevations are not numerous, and such experiments can be performed at heights exceeding 16,000 feet in India alone. The next best way is to compare them against the mercurial barometer and, as we had mercurials almost always with us, I took the opportunity to make experiments, with the result of finding that the boiling-point observations consistently yielded lower altitudes than the mercurial barometer, and I quote in illustration three of the highest stations at which water was boiled, namely, the summits of Cotopaxi, Antisana and Cayambe:

The elevation of Cotopaxi by merc. bar. was		19,650
" " "	boiling water	19,090
" " Antisana by merc. bar.		19,335
" " "	boiling water	18,714
" " Cayambe by merc. bar.		19,200
" " "	boiling water	18,600"

Of the glaciers he remarks: "As travelers of eminence have visited and published works upon this region, it is surprising to find that complete ignorance exists respecting its glaciers, yet that there is complete ignorance is evident from the statement made in the recently published article on Ecuador in the 'Encyclopedia Britannica,' in which it says that 'the crater of Altar, surrounded by a steep and jagged wall of rocks, is remarkable as the bed of the only real glacier known to exist in the Ecuadorian Andes.' I found on Altar larger glaciers *out*side the crater than that which was *in*side it; and I found others of large size upon Carihuairazo, Illiniza, Cotocachi, Sincholagua, Quilindaña, Cotopaxi, Cayambe, Sara-urcu, Antisana and Chimborazo."

There is little difference in general features in these equatorial glaciers from those of Europe. The Ecuadorian never descend so low as 12,000 feet, "and they generally terminate between 14,000 and 15,000 feet. Moraines are scarce upon them, for the reason that few rocks rise above them and the evidences which moraines frequently afford of former great extensions of glaciers is consequently wanting. *Roches moutonnées* are rare, more perhaps on account of the ease with which most of the rocks disintegrate than from any other cause. On the south side of Chimborazo, in a valley in which there is now no glacier at all, was the only place in which I was certain of *roches moutonnées*, but this single instance proved that glaciers on that mountain have formerly extended lower down than they do now. It may be stated, as a general rule, that crevasses in the lower parts of the Ecuadorian Andes are both smaller and less numerous than in corresponding situations in the Alps, and this I take to be an indication that in the inferior parts of these glaciers the rate of motion is less rapid than in the Alps. But in the higher regions they are frequently of enormous size, and we never anywhere had seen greater—if indeed so large—crevasses as we encountered on the upper part of Antisana, where some were at least from one-fourth to one-third mile long, 300 feet deep, and 50 to 60 feet across.

"Upon the whole I think that the glaciers are least extensive on the *western* sides of the mountains which have been enumerated, but I speak on this point with some hesitation, as I have not in several cases seen completely around them. It is only what might be expected in a country where vapor-laden easterly wind so largely preponderates. True east wind is, however, rare in comparison with north-east and south-east, which outweigh all the rest. Charged with vapor from the Amazonian cauldron,

these winds are almost ceaselessly blowing against the opposing sides of the Great Andes and depositing their moisture in the form of fine snow or hail. In the frequency with which it will be remarked that our ascents were made from the west, there is an illustration of our frequent inability to see anything through the clouds which enveloped the other sides. In *force* the winds were not remarkable."

GEOGRAPHICAL NEWS.—At a recent meeting of the Paris Geographical Society a letter from M. Rabot, now travelling in Norway, was read, which stated that the last two winters, "though very rigorous, have not had any great influence on the opening or closing of the passages because the summers have been remarkably warm. This year, on the other hand, navigation will be stopped very early, as the summer is reported to be a very cold one in the extreme north. M. Broek, formerly a minister of the Norwegian Government, thought there was confirmation of his expectations in the fact that vast numbers of birds, driven out by the rigor of the climate, are now alighting on the shores of Norway. They are arriving in such a state of starvation that they swallow the bait whilst the fishermen are casting their lines."——Three English gentlemen, Messrs. Delmar Morgan, Peek and Coles, have undertaken an exploration of the east-central and south-east portions of Iceland this summer. They take with them a valuable set of scientific instruments loaned by the Royal Geographical Society.—— The *Willem Barents* of the Dutch North Polar Expedition, has not been able to reach Spitzbergen this year. She found the ice extended in a compact mass from 68° 30′ N. lat. and 6° W. long. to 73° 30′ N. lat. and 14° E. long., some twelve geographical miles north of Vardö. There was ice also thirty miles south of Bear Island.——The steamer *Oscar Dickson* was frozen in at the mouth of the Yenisei River in 72° N. lat. and between 76° and 77° E. long. during the last winter. The winter was passed without serious disaster. The sun was below the horizon for seventy days and the cold rose to —41° C. Enormous masses of snow fell during March and April, covering the ice a height of seven feet above the ship's deck. The ice was seven and a half feet thick.——A partial survey was made last year by Commander Boulton, R.N., of the southern portion of Hudson's Straits and the exact position of many headlands and islands ascertained. During August ice formed at night. Between Koksoak River, the extreme point reached, and Cape Chudleigh and thence also to Nachvak Bay [N. lat. 59], Eskimo are the sole inhabitants.——The last number of the Bulletin of the Berlin Geographical Society contains a paper on the Climate of the Glacial Period, by Dr. Woeikoff. For the formation of glaciers a certain amount of moisture in the atmosphere as well as a low temperature is necessary. In the Woznesensky gold mine, at a height of 920 meters, the mean temperature is —90

Celsius, but the climate is rather dry and there are no glaciers. Dr. Woeikoff shows by examples that the difference of mean temperatures at the lower ends of glaciers reaches as much as fully 20°. Provided the quantity of rain and snow is great, glaciers descend as low as 212 meters above the sea-level, as in New Zealand, which has the latitude of Nice and the mean temperature of Vienna and Brussels. He also discusses the decided influence great masses of snow exert upon the temperature of a country.——Dr. Kirk, the English Consul-general at Zanzibar is preparing a work on the tsetse fly.——The Portuguese propose to establish four great stations in Central Africa from which the exploration of the surrounding districts can be carried on.—— The missionaries at the University's Mission Station at Masasi, state that the River Lujenda is believed to rise from a great lake east of Nyassa, and it is probable that a good sized lake still remains to be discovered to the north or north-east of Shirwa. ——The Italian travelers Dr. P. Matteucci and Lieut. Alfonso Massari reached Liverpool on August 5th, from a journey across Africa. They left Suakin, on the Red Sea, on March 5, 1880, and proceeded by way of Khartum and the province of Kordofan to El Fasher, the capital of Darfur. After wearisome negotiations they were allowed to go to Abeshr, the chief town of Wadai. They then visited Lake Chad, and after traversing Bornu, Baghirmi, Sokoto, &c., they arrived at Egga on June 8, 1881, and reached the Gulf of Guinea shortly afterwards. As the countries passed through are all more or less known, no great discoveries were made, though the travelers were the first Europeans to make the entire journey from the Red Sea to the Atlantic. Dr. Matteucci unfortunately succumbed to disease contracted during the journey, and died, after reaching London, on August 7th.——Mr. Thomson, the African traveler, has arrived at Zanzibar, having been employed by the Sultan to examine the mineralogy of the mainland and also to look for coal which is said to be found near the coast.——The new map of the United States, preparing under the direction of the U. S. Geological Survey, is on a scale of 1 : 250,000.——Dr. O. Finsch, the Polynesian traveler, arrived at Sydney from New Britain early in May last. During his visit of eight months in that island he made large collections, including 12,000 geological specimens. He now visits New Zealand, and goes afterwards to North Australia and thence to New Guinea, making careful observations of the character and habits of the natives of these regions.

MICROSCOPY.[1]

EXAMINATION OF CARBON DIOXIDE IN THE FLUID CAVITIES OF MINERALS.—Mr. Alexis A. Julien thus describes the method employed in his investigations:

"The qualitative identification of carbon dioxide in the cavi-

[1] This department is edited by Dr. R. H. WARD, Troy, N. Y.

ties of a mounted thin section of a mineral, may be determined, at least with probability, after some experience, through various optical appearances and physical characteristics which have been often described. It is usually effected with certainty and ease, through the rapid and enormous expansion and ultimate disappearance, either of the liquid or of the gaseous bubble, on the application of a gentle heat for a few seconds, such as that of a cigar, the heated end of a rod, or jet of hot air, or even a jet of the warm breath conveyed through a flexible rubber tube. When the slide and the thin section are thin, even the heat (37° C.) of the tip of one's finger, applied for a few seconds to the bottom of the slide without removal from the stage of the microscope, may be sufficient to produce the characteristic phenomena, *e. g.*, the contraction and disappearance of a bubble whose size is relatively small to that of the liquid in which it floats.

" For the determination of the temperature of disappearance of the bubble, which may vary from 20° to 32° C., several forms of stage heating apparatus may be employed. * * * In place of all these, a simple and inexpensive apparatus may be substituted, consisting of a miniature water bath in which are immersed the entire section and slide, the bulb of the thermometer, and the nose of the objective. It consists of a box of tinned copper (tinned iron is liable to rust), of length sufficient to project a few centimeters on either side of the stage of the microscope employed ; the one I use being twenty-three centimeters in length, 4 centimeters in width, and three centimeters in depth. This is laid across the stage of the microscope, separated from the metal by thin plates of cork, and is heated by a short wax taper (night-light) underneath either extremity. The slide may rest upon the bottom guarded from the metal by little rubber bands beneath the ends, and wedged firmly by a little wooden wedge beneath the horizontal thermometer bulb; or a thermometer with ring-shaped bulb may be inserted, upon which the slide may rest directly, firmly attached by one or two slender rubber bands. The thermometer should be of guaranteed accuracy, with wide degrees, subdivided if possible, with a range which need not much exceed 20 to 32° C. The preparation is then covered by any pure and clear water, preferably filtered (distilled is unnecessary), to a depth of about two centimeters. A circular aperture in the bottom of the box, eighteen millimeters in diameter, is covered with glass attached by cement, and through this the light is thrown up from the mirror. The cavity to be examined is then carefully adjusted and focussed, a taper is lit, and the eye remains at the eye-piece until the critical point is reached. A glass tube with its point terminating just below the edge of the slide, is connected with the mouth during the experiment by a small rubber tube. As the temperature slowly rises, a constant current of small bubbles of the warm breath (whose temperature,

32°, only assists the operation) may be blown up with little fatigue through the tube, to effect a thorough intermixture of unequally heated layers in the water stratum. The determination of the temperature of the disappearance of the bubble is easily obtained within five minutes, and that of its reappearance in about the same time. A low-power objective may be carefully wiped if its anterior lens is dimmed by flying drops or by rising vapor, when a high temperature is being attained; but it is best to insert the whole objective in a small, narrow glass beaker floating upon the surface of the bath over the preparation. * * * In place of the flowing tube a little agitator or churn at the end of the box had been previously tried, to produce the intermixture of the contents of the bath, but was given up on account of the inconvenient vibration and frequent dislodgment of the slide."

A still simpler apparatus was found to be more convenient when high temperatures were not required. In this case a plate of copper or brass 23 centimeters long, 6.5 centimeters wide, and 1 millimeter thick, with a central aperture of 2.5 centimeters, partly wrapped in pasteboard to prevent radiation, was laid upon the stage of the microscope. Over the central aperture was placed a glass tank about six centimeters wide and three centimeters deep, formed of a small chemical beaker with thin bottom and with its upper portion cut off; and in this tank were placed the object, a delicate thermometer and a pointed glass tube, with flexible rubber connection for blowing, held in place by a wire support attached to the metal plate. The section of mineral, mounted on a thin slide, is held in place by rubber bands, or by a small brass weight. Only a single taper is required, and the disappearance of the bubble may be completed in less than five minutes. In summer the temperature of the atmosphere alone may be sufficient, especially if assisted by the current of warm breath, to obliterate the gas bubble. Its return may be readily caused, in a warm atmosphere, by adding, from time to time, a few drops of cool water to the bath, while the eye remains at the eye-piece, and a steady current of air is blown through the glass tube; with this apparatus, which may be called the immersion warm bath, it matters little, for most purposes, what liquid, stand or objective is employed; and there is no difficulty in obtaining, satisfactorily, the two determinations within ten minutes, to an approximation of about one-twentieth of a degree. These forms of apparatus may be of service in other branches of thermal microscopy where an exact determination of the temperature applied is desirable.

Death of Charles A. Spencer.—Those who work with the microscope, or enjoy its teachings, will not soon forget that they have lost a friend in the death of this remarkable man, which occurred at Geneva, N. Y., on the 28th of September. Almost without preliminary education, he undertook the manufacture of microscopes, with little knowledge of the experience of others in

the same work, and but little qualification except his individual industry, intelligence and ingenuity. Apprehending the value of aperture as a means of resolution, far in advance of the rest of the world he produced objectives that were not only unequaled, but for a time quite unintelligible. The position so suddenly acquired was worthily occupied; and for nearly half a century Mr. Spencer has maintained a place, by his extraordinary genius for original contrivance and his tact in accomplishing extremely fine work, among the first of the manufacturing opticians in the world. His life was spent at Canastota, N. Y., except the last few years, which were spent at Geneva. From his shop at Canastota he sent out Mr. Tolles, who has since divided the honors with his instructor as a maker of extremely fine and really original microscopical work; and during recent years, as superintendent of the Geneva optical works, while feeble from age and failing health, he has proved so good an organizer and instructor, that his sons have been enabled to produce lenses that would not suffer by comparison with the best work of their father. Among the first and oldest of the original circle of microscopists in this country, and not more skillful as an optician than genial and friendly as a man, he will be greatly missed by his friends, and remembered and honored by all who are interested in his branch of science.

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SCIENTIFIC NEWS.

— The results obtained in the recent deep sea explorations by the Coast Survey steamer *Blake* are of special interest as affording new data for mapping down the floor of the Atlantic. Since May last the *Blake*, under command of Commander Bartlett, reports having run lines of soundings across the Gulf stream from the Florida straits to Cape Hatteras, at the same time making an examination of the great ocean current. The new data obtained show that the Bahama Banks extend in an almost level submarine plateau nearly two hundred miles in width off the Carolinas, and drawing to a point off Cape Hatteras only twenty-five miles off shore, where the depth of water increases to about two thousand fathoms. This revelation of the orography of the Atlantic bottom off our Southern coast is of no little significance. The average depth of water on this long plateau was found by the *Blake* to be but little over four hundred fathoms, and it seems evident, therefore, that it must serve as a vast submarine wall to divert from the Carolina coasts the major part of the glacial undercurrent setting from the Newfoundland Banks to the southwestward. A part of this arctic current, as it moves far beneath the surface, on reaching Cape Hatteras no doubt finds its way between the shore and the prolonged Bahama Bank, even to the Florida coast, but only a small part. The effect of this subma-

rine elevation running almost up to Hatteras, it would seem, is virtually to extend the Gulf stream basin of superheated water up to the North Carolina coast, thus giving the stream much more time after leaving the Florida pass to hold its equatorial temperature unreduced by free commixture with polar water. The Gulf stream is, as Lieutenant Maury said, "the carotid artery of the Atlantic ocean; the great current which connects in their circulation the waters of the arctic seas with the torrid zone," and every investigation which enables the hydrologist more accurately to gauge its thermal power is important.

If the view we have here taken, suggested by the preliminary report of the *Blake's* recent work, is sustained, the agency of the Arctic stream in cooling down the Gulf stream south of Hatteras, which figures as a very considerable factor in Dr. Carpenter's computations of Gulf stream heat, must be regarded as much feebler than it is generally supposed. It is to be hoped that when the details of the late exploration are reduced the results will be fully published. Surveys of this kind are of great value to navigation and science, but they ought to include each summer exact determinations of the temperature of certain sections of the Gulf stream. If we could ascertain every season the temperature, both surface and sub-surface, of this great oceanic artery at fixed points, it would be easy to deduce therefrom the great anomalous changes in the temperature and resultant weather of the northern hemisphere, as General Sabine years ago proposed to do, and thus be in position to forecast the general features of approaching seasons.—*New York Herald.*

— The following process is recommended by Abbass for producing metallic castings of flowers, leaves, insects, etc.:

The object, a dead beetle, for example, is first arranged in a natural position, and the feet are connected with an oval rim of wax. It is then fixed in the center of a paper or wooden box by means of pieces of fine wire, so that it is perfectly free, and thicker wires are run from the sides of the box to the object, which subsequently serve to form air channels in the mould by their removal. A wooden stick, tapering toward the bottom, is placed upon the back of the insect to produce a runner for casting. The box is then filled up with a paste of three parts of plaster of paris and one of brickdust, made up with a solution of alum and sal ammoniac. It is also well first to brush the object with this paste to prevent the formation of air bubbles. After the mould thus formed has set, the object is removed from the interior by first reducing it to ashes. It is therefore dried slowly, and finally heated gradually to a red heat, and then allowed to cool slowly to prevent the formation of flaws or cracks. The ashes are removed by pouring mercury into the cold mould and shaking it thoroughly before pouring it out, and repeating this operation several times. The thicker wires are then drawn out, and the

mould needs simply to be thoroughly heated before it is filled with metal in order that the latter may flow into all portions of it. After it has become cold it is softened and carefully broken away from the casting.

— Capt. G. J. Belknap, of the U. S. steamer, *Alaska*, has been taking soundings in the Pacific ocean off Callao bay during a run of 112 miles. At a distance of 102 miles from the shore he found a depth of 3368 fathoms, of nearly four statute miles. That was the deepest depression he could find. The casts brought up clay and greenish sand, the bottom temperature being about 34° Fahr.

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PROCEEDINGS OF SCIENTIFIC SOCIETIES.

Boston Society of Natural History, Oct. 5.—A paper on the species of Orangs, by Mr. F. A. Lucas, was read, and Mr. Burgess described the true mouth structure of the "water-tiger" (Dytiscus).

Academy of Natural Sciences of Philadelphia, March 8, 1881.—Professor Angelo Heilprin delivered the introductory to his course of lectures on invertebrate palæontology. A paper entitled "Structure, affinities and species of Scolopendrella," by John A. Ryder, was presented for publication.

March 15.—Professor Henry Carvill Lewis delivered the introductory to his course of lectures on determinative mineralogy. Mr. Theo. D. Rand called attention to microscopic preparations of minerals. Professor Lewis spoke of a specimen of smoky quartz containing water. Professor Heilprin made some remarks on *Nummulites raymondiopsis* and *Opercularia rotilla*. Mr. Reuben Haines made a communication on impurities in drinking water and the modes of determining them. Remarks on the same subject were made by Messrs. McCook, Heilprin and Morris.

March 22.—Mr. J. A. Ryder gave some of the results of his investigations on the development of the oyster. Dr. G. H. Horn spoke of the larva of a beetle, *Goes pervertulentes*.

April 5.—Professor Angelo Heilprin called attention to special characters in a specimen of Spirifer. Mr. J. A. Ryder made a statement with regard to certain disputed points in the organization of embryo fishes.

April 19.—Dr. Henry C. Chapman gave the results of his dissection of two hippopotami. Mr. Ryder spoke of the development of the nucleus in the ova of fishes and Mollusca. Mr. Tryon read extracts from a letter received from Mr. Hemphill relating to the habits of west coast limpets. Dr. G. A. König called attention to Reinsch's work on the micro-structure of Permian and Triassic coal. The subject was farther discussed by Professor Heilprin. A paper entitled "Observations on Planorbis," by R. E. C. Stearns, was presented for publication.

April 26.—Mr. Ryder spoke of the development of the American four-spined stickleback. A paper entitled "List of the fishes collected by Mr. W. J. Fisher upon the coasts of Lower California, 1876–77, with descriptions of new species," by W. N. Lockington, was presented for publication.

May 3.—Mr. Ryder described the spinning organ of the male stickleback. Dr. G. H. Horn made remarks on the classification of the Carabidæ.

May 10.—Professor H. C. Lewis called attention to a collection of beautiful concretions, and considered the mode of formation. Mr. Tryon read an extract from a letter by Henry Hemphill describing the arrival of a species of Glycimeris from Washington Territory. Mr. Thomas Meehan spoke of the numerical branching of Ampelopsis. Rev. Henry C. McCook made a communication on the spinning work of spiders, its nomenclature and classification.

May 17.—Papers on *Quercus rubra*, *Q. durandii* and *Rhus cotinoides*, by S. B. Buckley, were presented for publication. Professor Heilprin described certain unique specimens of Ammonite and Trigonia. Professor Lewis made further remarks on the concretions presented at a former meeting. Mr. Edw. Potts exhibited a specimen of Stapelia illustrating cleistogamous fertilization.

May 24.—A paper entitled as follows, was presented for publication: "Revision of the Palæocrinoidæ—Part II. Family Sphæroidocrinidæ, including the sub-families Platycrinidæ, Rhodocrinidæ and Actinocrinidæ," by Chas. Wachsmuth and Frank Springer. Mr. Thos. Meehan spoke of the sex of flowers in *Fritillaria atropurpurea*. Dr. Jos. Leidy considered the views of certain European naturalists regarding his genus Ouramœba. Rev. Dr. McCook spoke of the stridulating sound made by ants and how it might be produced. Remarks on the habits of the white ant were made by Drs. Leidy and McCook.

May 31.—The Rev. Dr. McCook read a report of the work done during the season in the department of instruction. A paper entitled "Observation on the Hippopotamus," by Dr. Henry C. Chapman, was presented for publication, the author giving verbally the substance of the communication. Mr. Edw. Potts exhibited a beautiful living specimen of Pyrophorus.

June 14.—A paper entitled "Notes on the Tertiary Geology of the Southern United States," by Angelo Heilprin, was presented for publication. Dr. Horn made some remarks on the entomological work of the late Baron Chaudoir, and then spoke of his, Dr. Horn's, arrangement of the Carabidæ. Mr. Potts defined the genera Heteromeinia and Carterella, and asked for material for illustration of the history of fresh-water sponges. Dr. Anders spoke of his observations on the evaporation of moisture from vegetation, the soil and water.

June 21.—Mr. Meehan spoke of the sudden appearance of

modifications in plants, illustrating his remarks by special reference to the presence or absence of the thorns of roses.

July 5.—A paper entitled "The snare of the ray spider, *Epeira radiosa*, a new form of orb-web," by Rev. H. C. McCook, D.D., was presented for publication. Mr. Meehan noted the discovery of *Lilium martagon* for the first time in the United States, and also spoke of the parasitic character of the Rocky mountain snow plant. In continuation he made some remarks on what might be called "floral clock-work," with special reference to the opening and closing of the flowers of *Talinum teretifolium*.

July 19.—A paper entitled "A revision of the Cis-Mississippi Tertiary Pectens of the United States," by Angelo Heilprin, was presented for publication.

July 26.—A note from Edw. Potts was read defining a new species of fresh-water sponge of the genus Carterella.

Aug. 2.—A paper entitled "Remarks on the molluscan genera Hippagus, Verticordia and Pecchiola," by Angelo Heilprin, was presented for publication.

Sept. 13.—Mr. Ryder gave some of the results of his studies of embryo oysters.

Sept. 20.—A paper entitled "Note on the approximate position of the Eocene deposits of Maryland," by Angelo Heilprin, was presented for publication.

Sept. 27.—Mr. Ryder spoke of the anatomy of *Arca pexata*, and also considered Balfour's and His and Rauber's views regarding the growth of embryo fishes.

Oct. 4.—The Rev. Dr. McCook explained how the orb-weaving spiders prepared their webs. Mr. Ryder spoke of a persistent cavity in the germinal disc of fishes, and its connection with the blood-vessel system.

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SELECTED ARTICLES IN SCIENTIFIC SERIALS.

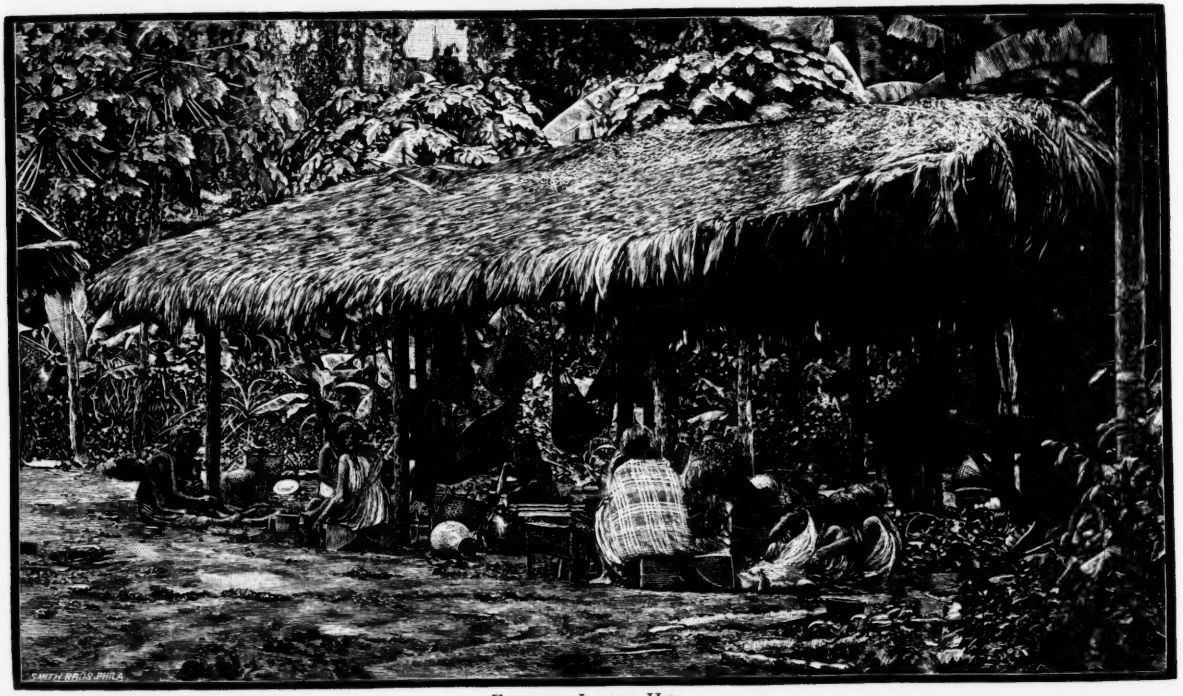
American Journal of Science, October.—Cause of the arid climate of the western portion of the United States, by C. E. Dutton. Embryonic forms of Trilobites from the Primordial rocks of Troy, N. Y., by S. W. Ford. Thickness of the ice-sheet at any latitude, by W. J. McGee. Marine fauna occupying the outer banks off the southern coast of New England, by A. E. Verrill.

The Geological Magazine, September.—The cause of the Mammoth's extinction, by H. H. Howorth. Absence of joint-structure at great depths, by W. O. Crosby.

Zeitschrift für wissenschaftliche Zoologie, August 19.—Locomotion and organ of locomotion of *Cyclostoma elegans*, and of other native snails, by H. Simroth. On the developmental history of the skull of Anura, by Ph. Stohr. The division of monothalomous Rhizopods, by A. Graber. On the development of *Neretina fluviatilis*, by F. Blochmann. On the allantois of man, by W. Krause.

MIAMI UNIVERSITY.

PLATE II.



Esequibo Indian Hut.